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MILLIKAN (C. R.) & LUDBROOK (W. V.). **Maize diseases in Victoria.**—*J. Dep. Agric. Vict.*, xli, 4, pp. 207–212, 8 figs., 1943.

Following a severe outbreak of root, stalk, and ear rots of maize in Victoria during the 1934–5 season, when a loss of about 150,000 bush. was caused in the Orbost district, a study of this group of diseases was conducted till 1942 by the Department of Agriculture, assisted since 1940 by the Council for Scientific and Industrial Research. The greatest losses, under Victorian conditions, are ascribed to ear rot [*R.A.M.*, xxi, p. 407], caused mainly by *Diplodia zeae*, although at times *Gibberella fujikuroi* var. *subglutinans* may be more common. The data concerning ear rot suggest that a check to plant growth through lack of moisture at tasseling may dispose maize to infection, the development of which requires suitable atmospheric conditions later in the season. During the very dry season of 1938–9 at Boisdale crops irrigated before tasseling were good, while those irrigated later were poor. Root and basal stalk rot is thought to be largely dependent upon climatic conditions, and infection usually follows natural senescence or premature physiological breakdown of the stalks. The latter may be induced by a sudden lack of moisture at tasseling and has been observed to occur on a large scale in Victoria, to be followed by extensive fungal rotting of the root and stem bases and shrivelling or complete absence of ear, under the following conditions: (1) in the first maize crop after a three-years pasture in a rotation experiment at Orbost, following a severe set-back during a dry spell at tasseling, and (2) in crops growing on a layer of rich alluvial surface soil overlaying an open sandy subsoil, following a dry spell at tasseling, when the plants may collapse through lack of reserve moisture in the subsoil. Further support for this view was afforded by the fact that an insignificant amount of disease developed in the presence of ample moisture in the soil when rainfall was sufficient to maintain a moist subsoil. Apart from these instances root and basal rot was largely confined to plants that have ripened somewhat prematurely but carried an average ear.

Seedling blight appears to be of minor importance in Victoria, but if cold wet conditions follow planting a considerable loss of stand may occur. Treatment with agrosan improved germination 38 per cent. and increased the yield from 66·8 to 80·4 bush. per acre.

Limited tests failed to find a disease-resistant maize among foreign hybrids; among local varieties none was very resistant, but Hickory King (with horny endosperm) developed slightly less ear rot during two seasons than white or yellow varieties with starchy endosperm. In crop-rotation experiments, maize after legumes showed 14·3 per cent. of basally rotted stalks at harvest, maize after oats 7·5 per cent., and maize after no green manure 8·1 per cent., the results offering little promise for disease control by green manuring with legumes.

Tratamento das Laranjeiras no Estado de São Paulo. [The treatment of Oranges in the State of São Paulo.]—*Biológico*, ix, 4, pp. 93–95, 1943.

Directions are given for the treatment of oranges in São Paulo against foot rot [*Phytophthora* spp., including *P. citrophthora* and *P. parasitica*], scab [*Elsinoe*

australis: *R.A.M.*, xx, p. 110], melanose [*Diaporthe citri*], and leprosis. Foot rot may be combated by the exposure of the collar and roots of the trees, to which 2 per cent. Bordeaux mixture should be applied, the operations being preferably carried out during the months of July and August, before the renewal of growth. The trench encircling the uncovered roots should be permanently maintained and kept clear of obstructing refuse, soil, and the like.

Scab attacks sweet oranges at a very early stage in the development of the fruits, when they are less than 1 cm. in diameter. Spraying with 1 per cent. Bordeaux mixture plus a miscible oil spreader, e.g., citrol, should begin in September, about a fortnight after the fall of two-thirds of the petals.

Similar methods are applicable for the control of *D. citri*, which is apt seriously to lower the market value of the fruits. The pathogen thrives among the dry wood of old groves and is little in evidence in young, vigorous plantings. Cultural measures should include a thorough winter pruning to remove all shrivelled material, and improvement of the soil by tillage, harrowing, and the cultivation of green manures or the maintenance of an 'undergrowth' of Guinea grass [*Panicum maximum*] and other plants during the rainy season: this should be cut in April and left lying on the surface of the soil where it acts as an excellent covering, helping to prevent the evaporation of moisture in dry weather and the destruction of the microbiological population by the sun's rays.

Leprosis, prevalent from January to April, is amenable to treatments which exterminate the insect vectors of the disease, e.g., spraying with 1 per cent. miscible oil or lime-sulphur, one application being given in January and another, if necessary, at the beginning of March.

KLOTZ (L. J.). **Phytophthora infections of Citrus.**—*Calif. Citrogr.*, xxviii, 8, pp. 200–201, 220–221, 4 figs., 1 graph, 1943.

The author gives the geographical distribution (recently revised by H. S. Fawcett) of the species of *Phytophthora* found on citrus, especially those concerned in brown rot [*R.A.M.*, xxii, p. 132], chiefly *P. citrophthora* (which is now listed in the Argentine and Brazil), *P. parasitica*, and *P. hibernalis*, and briefly reviews the work done on the disease. A method of securing sufficient quantities of zoospores for experimental purposes is described, consisting in growing the mycelium on sterilized lucerne stems for one to two weeks and then transferring the stems with the fungus growth to running water. Sporangia developed abundantly in 24 hours; to induce the discharge of zoospores a sudden slight lowering (in the case of *P. parasitica* lowering or raising) of temperature was sufficient.

In recent spraying experiments on lemon trees with spreader-stickers in conjunction with Bordeaux mixture, copper oxychloride, tetrachloro-para-benzoquinone, and other materials, five gave satisfactory results, namely, petroleum oil with sulphonic salts and an organic surface tension depressant, sodium oleyl sulphate plus a synthetic resin, metal soap with casein and sulphonic salts in a petroleum oil emulsion, whale oil-resin soap, and casein (the parent product, not its calcium or sodium salts), all used at 0·5 lb. per 100 gals. The value of the copper materials was again evident, but outstanding results were obtained with the new fungicide tetrachloro-para-benzoquinone (*Citrus Leaves*, xxiii, pp. 11–13, 1943), which entirely controlled brown rot in 14 lots each of 20 lemons from sprayed trees, when applied in concentrations ranging from $\frac{1}{4}$ to 1 lb. per 100 gals., while control fruits from unsprayed trees had an average of from 25 to 40 infections per lemon. The material did not seem to aggravate fumigation injury and left no visible deposit even when used at the rate of 1 and $\frac{1}{2}$ lb. per 100 gals. The hope is expressed that its cost will be put on a competitive basis with copper materials in view of the scarcity of the latter. It is suggested that growers try the new material on a few trees in comparison with Bordeaux mixture.

FENNAH (R. G.). **The Citrus pests investigation in the Windward and Leeward Islands, British West Indies, 1937–1942.**—66 pp., 2 pl., 7 graphs, Trinidad, Imperial College of Tropical Agriculture, 1942.

In the section (pp. 38–52) of this report dealing with the dying out of seedling limes [*Citrus aurantiifolia*] in the British West Indies it is stated that in or about 1927 seedling limes in Dominica became attacked by a root disease, which, from the presence of the rhizomorphs of *Sphaerostilbe repens* on some of the dead roots was locally attributed to fungal infection and named 'red root disease' [*R.A.M.*, vii, pp. 373, 715; xxi, p. 281]. All the principal seedling cultivations in the island died out in a few years. The disease was also recorded in Montserrat and St. Lucia.

The symptoms of the 'root disease' are as follows. The leaves on one or two branches turn yellow and fall, and the fruit shrivels up, often without being shed. The affected branch is connected with a dead root by a strip of dead bark (underlying which is a strip of dead wood) running down the trunk. Sometimes, several of these dead strips run downwards side by side to their respective roots, and occasionally first one half of the tree dies, then the other. Though these are usually the first symptoms to be noted, they are signs that the final stage of the condition has been reached. The first stage shows as a shrivelling or permanent wilting of the small fibrous feeding roots of a tree apparently healthy in all other respects. Such rootlets are nearly always dead when found. The death of the woody tissues in the cambium is preceded by gum formation. Under certain conditions this gum fails to seal off the dead portion of wood. Later on, a strip of wood inside the cambium, corresponding in size to the basal portion of the dead root, dies back to the trunk, spreads upwards, and passes to a branch in vertical vascular continuity with the dead root below. This gives rise to the leaf-shedding and fruit-shrivelling. The dead wood often becomes invaded by various fungi, and turns grey, at least in the drier, above-ground parts. The cortical tissues overlying the dead wood die later than the wood beneath, copious gum frequently being produced from the adjoining healthy edges ('bleeding'). When the bark on a root has died to a certain point, the wood is usually dead for about 1 ft. farther on, while beyond it gummed tracheae extend to a point several feet above ground; such gummed wood is golden-yellow. The exposed dead wood on the larger roots is bordered by a very weak callus, and frequently the injury somewhat resembles that due to a larva of *Diaprepres* spp.

Branch 'die-back', so familiar in Montserrat, is a closely connected, but far less serious trouble. Defoliation occurs, nearly always at the top or on the windward side, and the wood and bark die downwards together. Progress is slow, and often becomes arrested at the point of emergence of a branch or a bud lower on the trunk, or it may be stopped by callus and gum at any point. The condition is followed by extensive re-shooting from the base.

Records of root disease are quoted, which show clearly that the condition is identical throughout the Lesser Antilles. Briton-Jones in 1928 concluded in Dominica that neither *S. repens* nor the other fungi present were primary parasites [loc. cit.], the trouble being due, probably, to other factors and this view was supported by Ashby in 1929 [ibid., ix, p. 20], and by Baker (in St. Lucia) in 1938 [ibid., xvii, p. 671].

The author carried out a series of inoculations into living roots of seedling limes at a depth of about 6 in., using *S.* [*repens*] and other fungi from dead lime wood; he also inserted slips of diseased or gummed bark and the exudate occasionally found in subcortical blisters under the trunk and root bark of apparently healthy trees, on a hillside in St. Lucia where dying-out had recently been present. No positive result was obtained. Furthermore, young seedling limes (2 to 3 years old) which had failed in a light soil area in St. Lucia or showed typical 'root disease' symptoms in Montserrat were dug up and found to show the presence of no

parasitic fungus at all. Evidence was also obtained which clearly demonstrated that 'root disease' had no connexion with *Diaprepes* spp.

Further work brought to light the fact that the conditions under which 'root disease' appeared in the different islands conformed to a pattern. It occurred first, or at an early age, on light, and later on heavy soils. Dry areas died out before moist (but not very wet) ones, and exposed places before sheltered ones. It appeared that the trees died first in parts where water loss by transpiration was high and soil moisture low or fluctuating markedly from season to season. Data obtained in a survey and by other means showed that survival of seedling limes is possible only if three of the following factors are wanting: (1) low dry-season atmospheric humidity, (2) low available soil moisture in the dry season, (3) an unaerated or generally waterlogged soil, (4) severe wither-tip in the wet season.

Next, a main root on each of five trees was exposed to the extremity, and allowed to dry out on the soil surface, to provide the conditions arising when all the fibrous roots feeding a main root die. The treated roots died, and strip formation began. By the end of 1938 one strip had spread from the root to a point 8 ft. above the ground, and by April, 1939, it had extended along all the branches in its sector, advance occurring at the rate of 8 in. a month, at least 6 ft. being formed in the wet season or during dry periods in the wet season.

The author's interpretation of the known facts is as follows. The internal water supply of the trees is, at least for substantial periods, near the lower limit of adequacy. During the dry season water losses are periodically severe, all water movement occurs along the transpiration stream, and lateral diffusion is at a minimum. When one of the larger roots dies, water is unavailable for another part of the trunk, and permanent injury is done to the dry section, where gumming occurs in the vessels, followed by drying of the wood, and death of the protoplasm in the overlying cambium and cortex. When these tissues have shrunk and dried, a dead strip forms. In the wet season the water loss is smaller, and diffusion of water is possible. Hence, a root exposed and insulated from the soil in the wet season may be sustained by the rest of the root system, with the result that there is no dying upwards. The death of the rootlets cannot as yet be attributed to any cause but lack of water. Search for pathogenic organisms invariably gave negative results.

The author considers that seedling limes can again be successfully established in areas where the four factors mentioned above are absent, and perhaps where only three are absent. The right conditions are present where there are light overhead shade, a well-drained, not too light soil, and an even underground water table or water supply. Until the process by which the fibrous rootlets are killed has been determined, there must be some risk in any such planting project, but if limes budded on a suitable stock are used, such risk is eliminated.

SALGADO (M. L. M.). **Note on physiological stem bleeding of mature Coconut palms.**—*Trop. Agriculturist*, xcviii, 2, pp. 31–35, 1942.

An account is given of some previously undescribed forms of physiological stem-bleeding of coco-nut palms in Ceylon. On two estates the condition was observed to follow manuring. In the first case observed many years ago the 50-year-old trees had received a mixture consisting of 2 lb. cyanamide, 4½ lb. bone meal, and 1½ lb. muriate of potash. In the second, noticed in 1940, 40-year-old palms had received 6 lb. sulphate of ammonia, 4 lb. saphos phosphate, and 3 lb. muriate of potash per palm. Manuring was followed by prolonged drought, which was interrupted by a heavy south-west monsoon in May and June. Bleeding began towards the end of July and affected 85 out of 384 palms. The reddish-brown, circular, superficial patches reached a diameter of 2 or 3 in. and started 2 or 3 ft. from the base. They spread spirally upwards to a distance of about half the length of the stem. It is considered that the bleeding may have been due to excessive sap formation pro-

duced by the sudden absorption of a large supply of nutrients as a result of rains following drought.

Two distinct types of bleeding were due to heavy rains following prolonged droughts with rise of water table. One type occurred after floods, and was more serious than the cases mentioned before. It developed in January, 1939, on rather heavy soil with badly drained impermeable clay subsoil inundated during periodical floods. The patches were reddish-brown, more extensive than in the cases already mentioned, and reached a greater height on the stem. The affected tissues extended to a depth of about an inch, and spread spirally in the path of the vascular bundles.

A second extremely severe, often fatal, type was noted on land with a fluctuating water table, in three areas of the Northern Province, all characterized by low rainfall and long droughts. The patches were reddish-brown and extensive, starting near the base of the trees, and almost reaching the crown. From the bleeding point the patches spread down to a distance of almost a foot. Several apparently healthy, mature palms succumbed to this type of bleeding, which increased in prevalence towards the end of the wet season.

As remedial measures the author recommends that diseased parts be excised and the cuts tarred over, that drains be cut in order to lower the water table during the rains, and that husks be buried in a circular trench round the base of the palm in order to retain moisture during drought.

Niño (F. L.). **Ulcera micótica de córnea (estudio micológico de una observación).** [Mycotic ulcer of the cornea (mycological study of an observation).]—*Prensa méd. argent.*, xxx, 18, pp. 797–806, 14 figs., 1943.

A fungus tentatively identified as *Sporotrichum fonsecai* Pereira was isolated from an ulcer of the cornea in a 62-year-old male patient at the Surgical Clinic, Buenos Aires. Its macroscopic characters on a number of standard media are fully described. In hanging drop cultures on Sabouraud's glucose agar at 25° C. the hyaline, irregularly septate, straight or slightly flexuous, profusely branching hyphae, 1 μ or upwards in diameter, contain numerous fat globules, and bear many ellipsoid to fusiform, Gram-positive spores, 3 to 5 by 1 μ, with rounded extremities. The spores either arise directly in groups from the fertile hyphae or are borne, three or four at a time, at the apex of a kind of phialid. Intercalary chlamydospores develop in older cultures. *S. fonsecai* acidifies glucose, galactose, levulose, and maltose, coagulates milk, and partially hydrolyses starch.

Volk (R.) & Cañas (E.). **Un caso de blastomicosis.** [A case of blastomycosis.]—*Medicina, Méx.*, xxii, 426, pp. 615–623, 7 figs., 1942.

The fungus isolated from the lesions of vegetative ulcers in a 33-year-old male patient in Mexico, D[istrito] F[ederal], was identified by A. Gonzalez Ochoa, of the Mycological Laboratory, Institute of Tropical Diseases, as a species of *Geotrichum* differing from those listed by Dodge in his 'Medical Mycology' [*R.A.M.*, xv, p. 368]. It was cultured on a number of standard media, solid and liquid, at 27° and 37° C., forming on Sabouraud's 2 per cent. glucose agar discoid, salient, waxy, adherent, membranaceous to coriaceous, radially rugose, ivory-coloured colonies, and straight or undulating branching hyphae, 3 to 30 by 3 to 6 μ, dissociating into arthrospores which converge in broken lines and sometimes terminate distally in a long, slender spiral filament. The fungus did not ferment any of the sugars tested, but it produced acid in glucose, galactose, saccharose, maltose, and fructose; gelatine was not liquefied or milk coagulated. Positive results were obtained in inoculation experiments on white rats, from which a fungus identical with the one under discussion was reisolated.

NATTRASS (R. M.). **The pasmo disease of Flax in Kenya, Sphaerella linorum Wollenweber.**—*E. Afr. agric. J.*, viii, 4, pp. 223–226, 1 pl., 2 figs., 1943.

The diseases from which flax has suffered in Kenya during the last 20 years are, in descending order of importance, rust (*Melampsora lini*) [*R.A.M.*, xvi, p. 796], wilt (*Fusarium* sp.) [cf. ibid., vi, p. 533], and stem-break or browning (*Polyspora lini*) [ibid., iii, p. 443]. In recent years the importation of flax seed into Kenya has been allowed only from the British Isles, and as pasmo disease (*Sphaerella linorum*) is not present in Britain, it is remarkable that a sudden, widespread epidemic should break out in Kenya in 1941 [ibid., xxi, pp. 5, 352, 418; xxii, p. 168], apparently the first record from Africa. Linseed has, doubtless, been imported into Kenya from America at some time or other between 1922 and 1942 and the fungus may have been introduced at any time during this period, persisting unnoticed until suitable climatic conditions for an epidemic outbreak occurred. In this connexion it is noteworthy that exceptionally prolonged wet periods were experienced during 1941–2. On the other hand, it is possible that pasmo disease may have been introduced with recent military and other shipments from America.

Under the conditions prevailing in Kenya infected straw and crop debris are the most probable sources of infection. There is little doubt that pycnidia and spores can remain viable from one crop to another. It is not certain that seed transmission is usual in Kenya. Seeds from a badly infected 1941 crop produced plants with no sign of the disease, and when tested by the Ulster method [ibid., xx, p. 261], failed to produce any growth of the fungus; neither was the organism found in centrifuged washings of the same seed. Pending further investigations, however, it is safest to assume that in Kenya, as elsewhere, *S. linorum* is carried by the seed. Small particles of infected material may carry pycnidia and dried spore masses, which remain with the seed after cleaning.

Flax should not be grown on land which carried flax the season before. Seed from an infected crop should not be sown. The movement of seed and straw from infected areas should be controlled, and fresh outbreaks notified at once. Field sanitation is important; straw and stubble in the case of linseed, and crop debris in that of flax, should, if the crop is diseased, be destroyed. Seed treatment with agrosan or ceresan U is recommended. The two varieties grown in Kenya, Liral Crown and Stormont Gossamer, appear to be equally susceptible.

MUSKETT (A. E.) & COLHOUN (J.). **The prevention of seed-borne diseases of Flax by seed disinfection.**—*Ann. appl. Biol.*, xxx, 1, pp. 7–18, 1 pl., 1943.

In this paper the authors give a full account of work carried out in Northern Ireland from 1939 to 1941, inclusive, on the prevention of seed-borne diseases of flax (chiefly stem-break and browning due to *Polyspora lini* [*R.A.M.*, xxi, p. 489], and seedling blight caused by *Colletotrichum lini* [loc. cit.]) by seed disinfection. Suitably infected seed samples were selected by the Ulster method [loc. cit.], and a laboratory technique was devised which permitted a rapid evaluation of materials likely to prove useful as seed disinfectants.

Formaldehyde proved ineffective or phytocidal, cuprous oxide was of no use, and the results obtained by the dusting method indicated that the use of organomercury powders at dosages comparable with those effective for cereals was unsatisfactory. The short liquid method was then tried, using ceresan (U. 564), at 2, 4, and 8 per cent. solution, applied at 20, 30, and 40 c.c. per 500 gm. The method was superior to the dry one, and very promising results were given by the 8 per cent. solution at 30 or 40 c.c. In 1941 the fixation method was used, in which the dust is fixed to the seed by the use of water or separated milk. Ceresan (1875 A) was selected for the test. In the first place the seed was treated with the powder by the usual method at the rate of 3 gm. per 500 gm. of seed. Afterwards the seed was treated with water or separated milk at the 40 c.c. rate. The results of the fixa-

tion method showed marked improvement over those given by the dry treatment at twice the dosage, and were comparable with those of the short-liquid treatment using an 8 per cent. solution of an organo-mercurial applied at the 40 c.c. rate. Both water and milk were equally satisfactory.

In 1940 and 1941 tests were made with 'nomersan', a non-poisonous white powder containing tetramethyl thiuramdisulphide as its active constituent, manufactured by Imperial Chemical Industries, Ltd. [ibid., xx, p. 535]. This was used at 1·5, 3, 3·35, and 6 gm. per 500 gm. The promising nature shown by this material in preliminary laboratory tests was confirmed in field trials. Its action was selective; applied at the 3 gm. rate, it almost eradicated *C. lini* from infected seed, but its effect on *P. lini* was not very satisfactory, being less than that of organo-mercury powders used at the 6 gm. rate. The same selectiveness was observed in the suppression of mould growth on seeds; its bactericidal qualities were poor. No additional advantage accrued by using the fixation method with nomersan. All flax seed sown in 1941 and subsequently has been treated with nomersan at a cost of 2*s.* 6*d.* per acre.

In the case of stem-break and browning almost all the seed treatments significantly increased the crop weight. In 1940 the best treatments produced crops of over 2·5 tons per acre, as compared with 1·65 tons for the untreated controls, while in 1941 the corresponding figures were 2 and 0·8 tons respectively. Only the most promising treatments significantly increased fibre yield; in 1940 they gave about 3·75 cwt. per acre, as against 2·5 cwt. for the controls, the corresponding figures for 1941 being 1·76 to 1·91 and 0·41 cwt., respectively. The explanation why a significant increase in fibre yield did not result whenever the crop yield was increased is that where treatment was only partially effective and allowed browning to spread, some of the fibre was injured.

The case of seedling blight is different. In neither 1940 nor 1941 did seed treatment give a significant increase in crop weight, but in both years the best treatments significantly increased fibre yield, the figures being about 6·25 as against 5 cwt. The suggestion is made that the higher fibre yields may have been due to the production of a more even crop of healthy plants from the treated seed.

Tentative methods of test for resistance of textile fabrics to microorganisms.—*A.S.T.M. Stand., 1942*, pp. 59–62, 1942.

Two procedures are proposed by the Committee D–13 on Textile Materials of the American Society for Testing Materials in connexion with the testing of canvas, duck, and similar fabrics designed for outdoor use, viz., (1) an accelerated mildew infection test in which the material is incubated with a stock culture of *Chaetomium globosum* [*R.A.M.*, xxii, p. 73], and (2) a soil burial test, involving the burial of specimens of the fabrics for six weeks in soil containing an abundance of cellulose-destroying organisms maintained at a temperature of 90°±5° F. at a depth of 1 in. below the surface. The visible effects of the experimental processes on the materials are observed and loss in strength determined.

Caldwell (J.) & Prentice (I. W.). **An investigation into the 'stripe' disease of Narcissus. II. Experiments on the virus agent and its spread.**—*Ann. appl. Biol.*, xxx, 1, pp. 27–32, 3 figs., 1943.

Further investigations into narcissus stripe [*R.A.M.*, xvii, p. 603] showed that chlorosis is the commonest reaction to infection in the field. It is most conspicuous when the leaves are 3 to 4 in. long. Warm weather seems to cause masking of this symptom. Proliferation frequently occurs, and is not masked by high temperatures; it takes the form of an outgrowth of the mesophyll tissues under or through the epidermis. In the field it becomes increasingly plain in mid-season. Distortion accompanied by severe local chlorosis was noted in certain varieties but its

incidence and severity were variable. Some varieties, particularly Beersheba, Damson, Bath's Flame, and Sunrise show leaf corrugation.

In September, 1937, in order to study the manner of spread of the disease in the field, two plots of healthy bulbs were prepared, and rows of diseased bulbs were planted round them. One plot was sprayed with an insecticide during the season 1937–8. The other (unsprayed) was enclosed in a wooden frame sunk into the ground for about 2 ft. and not protruding from it. In 1938–9 the plots showed 3 and 14 per cent. disease, respectively, from which it was concluded that the transmission of the disease takes place above ground and not through the roots. This conclusion received further support from more extensive experiments with the variety Sir Watkin.

When sorted according to weight, as compared with the healthy bulbs a larger proportion of infected bulbs fell into the lower-weight classes, and a smaller proportion in the higher-weight, suggesting that the infected bulbs multiplied less rapidly and produced smaller daughter bulbs than did the healthy ones. Further work demonstrated that the flower stalks of healthy plants were slightly longer than those of diseased ones, and the flowers on healthy plants matured a few days before those on diseased plants.

No evidence was found of seed transmission in hundreds of seedlings studied but the virus was successfully transmitted by bulb grafting (18 out of 18 graft unions) and by juice inoculation with the use of an abrasive such as carborundum (about 15 per cent. successful). Inoculations into Tresserve produced symptoms of the Tresserve type, whatever type of symptom was shown by the variety used as the source of inoculum, indicating that the agent is a single virus and not a complex, as previously suggested [loc. cit.]. Juice from hyacinth, crocus, iris, and tulip infected with mosaic did not produce infection in narcissus. When tulip plants were treated with the juice of narcissus plants severe lesions developed on the tulip leaves, and when grafts between the two plants were attempted the tulip bulb succumbed.

Careful roguing at frequent intervals is recommended for controlling the spread of the disease.

CREAGER (D. B.). **Carnations attacked by wilt on coast and midwest.**—*Flor. Rev.*, xci, 2348, pp. 13–15, 1942. [Abs. in *Biol. Abstr.*, xvii, 4, pp. 1089–1090, 1943.]

Pseudomonas caryophylli, reported from Washington, Illinois, Iowa, Indiana, and Missouri, develops rather suddenly on carnations, causing a grey-green, later tan or brown wilting of the top or branches, accompanied by a yellowish to brown internal discoloration of the stem, softening of the cortex of the stem base, and a sticky consistency of the inner wood. Infection is most severe during warm periods in the late spring, summer, and early autumn. The pathogen may be combated by the following sanitary measures: selection of cuttings from healthy plants and immersion of the former in a solution of potassium permanganate (1 oz. in 7½ gals. water) before insertion in the propagation bed, soaking in water alone being inadvisable; steam sterilization of propagation media and bench, of soil, pots, and flats for starting new plants after rooting, and of soil and bench for growing on; and a three- to five-year rotation for field plantings.

WEIMER (J. L.). **A Botrytis disease of Lupines.**—*Phytopathology*, xxxiii, 4, pp. 319–323, 1 fig., 1943.

A fungus identified as a member of the *Botrytis cinerea* group on the basis of its morphological and cultural characters was observed to cause a stem and branch canker of lupins (*Lupinus angustifolius*) at Tifton, Georgia, and to a lesser extent at Gainesville, Florida, in February, 1938, following a January freeze. The affected areas are frequently girdled and the parts above them killed. The results of inocu-

lation experiments showed that freezing was not essential to infection, but the tissues thus damaged appear to provide an easy channel of ingress for the pathogen. Good growth was made on a number of standard media, including potato dextrose (2 per cent.) agar, though fruiting was very sparse except on oatmeal agar on a long slant in a large test tube, on which the mycelium ranges from 8 to 12·6 μ in diameter and the spores measure 8·4 to 13·6 by 6·8 to 10·5 (average of 50, 8·2) μ. The disease under observation is evidently the same as that previously reported from New Zealand [*R.A.M.*, ii, p. 504], Germany [ibid., vi, p. 732], and South Africa [ibid., x, p. 602]. General precautionary measures against infection include rotation, avoidance of wet areas, not too thick sowing, and the use of the hardiest varieties available.

MARENGO (L. V.). **Fusariosis del Girasol (Helianthus annuus L.).** [Fusariosis of the Sunflower (*Helianthus annuus* L.).]—*Rev. Fac. Agron., B. Aires.*, x, 1, pp. 130–147, 9 figs., 1942. [English and Portuguese summaries.]

Fusarium solani var. *minus* was isolated on potato glucose agar from diseased sunflower plants at the University of Buenos Aires and its cultural and morphological characters are fully described. The disorder develops on 7- to 20-day-old plants under two forms, viz., (1) wilt, accompanied by collapse of the tissues and causing a gentle downward bending of the stem, and (2) damping-off. An examination of the root system reveals the presence between the collar of the hypocotyl and its first rootlets of sunken, necrotic lesions, which may entirely girdle the stem and in some cases penetrate to the medulla.

Of three methods of inoculation tested, the most effective consisted in the application to each sunflower seed sown of fragments of sterilized seed bearing the developing mycelium and spore of the pathogen. The infected plants contracted damping-off symptoms within a period ranging from a week to a month from germination.

A brief review is given of some previous contributions to the knowledge of sunflower diseases, from which it appears that *F. solani* var. *minus* has not yet been recorded as a pathogen of the host in question. A bibliography of 44 titles is appended.

KOLK (LAURA A.). **Germination of grass smuts.**—*Amer. J. Bot.*, xxx, 4, pp. 317–330, 39 figs., 1943.

The following observations were made from germination studies of seven smuts of wild grasses and from comparisons with seven well-known cereal smuts. *Ustilago underwoodii* on *Panicum virgatum* germinated rapidly, producing abundant conidia from a short stub or projection of the protoplast from the spore wall, commonly without forming a promycelium, although the conidia may become septate and also increase by budding. It did not develop a mycelium, being in this respect similar to *U. bromivora*, *U. hordei*, and *U. avenae*, all three of which produce abundant conidia usually from short promycelia. *U. togata* on *P. dichotomiflorum* produced abundant conidia but also tended strongly to form long hyphae, either in place of a promycelium or in addition to it, frequently producing both types from the same spore. The growth of the emerging protoplast is less checked in this species than in the smuts mentioned above. The same development occurs in *Sphaceloma sorghi*, *S. holci*, and *S. cruenta*. *U. hypodytes* on *Stipa californica*, *S. occidentalis*, *Distichlis stricta*, *Elymus condensatus*, and *Agropyron trichophorum* frequently produced conidia on tips of branches growing out of promycelial cells, although abundant promycelial conidia also developed at times; consequently there was less check upon the growth of the emerging protoplast. All collections of this smut formed mycelial mats either directly from the spore or from conidia and bore aerial conidia. *Sorosporium syntherismae* on *P. dichotomiflorum*, *U. rabenhorstiana* on

Digitaria sanguinalis, and *D. ischaemum*, and *U. neglecta* on *Setaria lutescens* germinated slowly and showed a strong mycelial tendency with little check upon the growth of the germ-tube, giving rise to a long, more or less non-septate hypha or a mass of branching hyphae. Aerial conidia were observed in *Sorosporium syntherismae*, and aerial mycelium in *U. rabenhorstiana* and *U. neglecta*.

The author stresses the necessity for great caution in naming new species of smuts or renaming old ones. Careful experimentation should be conducted previous to identification and the following taken into account: (1) morphological characters associated with disease manifestation on the host, and the effect on the general habit of growth of the host; (2) spore characters and the type of germination based on data from repeated trials conducted over a sufficiently long period; and (3) infection capacity of the smut on a number of hosts. Previously described smuts, the typical form of which is not completely studied, should not be used for placing new forms. For this reason the author hesitates to accept *U. bullata* in place of *U. bromivora*, and also suggests that further experimental work is necessary to fit *U. perennans* into the picture of the known physiologic races of *U. avenae* before deciding on a change in nomenclature as proposed by Fischer and Holton [*R.A.M.*, xxi, p. 11].

Bernstein (P.) & Marshall (R. E.). **A study of internal breakdown of Northern Spy Apples in storage.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxv, 2, pp. 156–162, 3 figs., 1942.

Various combinations of manurial treatment, fruit-thinning, and irrigation practices were applied to 20 23-year-old Northern Spy apple trees to determine the relation of these factors to internal breakdown in storage.

The most important fact established by the investigations was the failure of fruits upwards of $3\frac{1}{4}$ in. in transverse diameter to escape breakdown during the ordinary commercial storage season, the abnormal condition developing after about two months at 32° to 33° F. or even earlier at higher temperatures. It is therefore recommended that a fractional picking of apples likely to attain the critical dimensions should be made some ten days before the usual commercial picking, and the fruits exceeding 3 in. in diameter stored in sacks that can be transferred from storage to the consumer before mid-December. Where two pickings are impracticable, harvesting should be carried out at the usual time and the fruits divided into two grades, those of $3\frac{1}{4}$ in. and upwards being stored for a period not exceeding eight weeks, while the remainder may be kept at 32° until March if desired.

The storage season for large, susceptible fruits may be appreciably prolonged by storage at 40° in rooms equipped with facilities for the maintenance of a concentration of 5 to 10 per cent. carbon dioxide in the atmosphere. The writers do not advocate attempts to regulate the size of the apples by cultural methods except the avoidance of overhead irrigation in seasons of light bearing.

Wilcox (J. C.) & Woodbridge (C. G.). **Some effects of excess boron on the storage quality of Apples.**—*Sci. Agric.*, xxiii, 6, pp. 332–341, 3 figs., 1943.

Two types of fruit injury were induced or aggravated by excess of boron in apples from trees previously suffering from boron deficiency in British Columbia. Both developed in storage, one in the McIntosh variety, the other in Jonathan. In the former the primary bundles midway between the carpel points turned brown, the discoloration spreading outwards along the core line, and affecting the area round the core ring; the flesh also became discoloured round the stem cavity. In the latter typical water core and flesh breakdown symptoms were increased by excess boron. A lowering of the storage quality may occur without any evidence of leaf or twig injury and only with the heaviest applications was the injury severe enough to render the fruit unmarketable. A highly significant positive correlation was

obtained between the amount of boron applied to the soil and the boron content of the fruit (both varieties), and also between the boron content of the fruit and the flesh breakdown of Jonathan. When the season is conducive to fruit injury, this injury is more likely to occur and to be commercially detrimental when the boron content is higher than 24 p.p.m. of the dry weight, and in such seasons the optimum content for the fruit may fall within the narrow limits of 10 and 20 p.p.m. Seasonal differences and amount of crop affect the degree of injury to the fruit, for in 1939 no apparent injury occurred on the Jonathans, whereas in 1938 and 1941 the heavier applications induced severe water core and flesh breakdown.

Storage troubles aggravated by excess boron may occur when boron is not present in excess. In 1941 storage breakdown affected 17 per cent. of the fruit from a tree which had received only 6 oz. of borax in six years. Other evidence suggested that even fruit from trees not treated with boron compounds might become affected by severe water core and flesh breakdown.

In 1938 boron contents over 24 p.p.m. were found in fruits from one tree given 32 oz. of boric acid three years before, from two trees given 64 oz. three years before, and from six trees given 8 oz. or more of borax or boric acid annually for three years. In 1939 the high-boron fruits came from two trees given 64 oz. four years before, and from nine trees given 8 oz. or more annually for four years.

The data indicate that deleterious effects on the storage quality of apples are possible when more than 32 oz. boric acid or its equivalent is applied to a tree in any one year, or when 8 oz. or more are applied annually. This finding is not necessarily applicable to other conditions than those obtaining in the authors' studies.

Lyckås (C.). **Skador på lagrad frukt.** [Damage to stored fruit.]—*Fruktodlaren, Stockh., 1941*, 6, pp. 175–178, 5 figs., 1941.

Notes are given on the principal causes of damage to stored apples in Sweden, viz., green mould (*Penicillium glaucum*), the commonest and, generally speaking, most destructive of all parasitic storage diseases, capable of further development at 0° C., though a fairly high temperature is requisite for initial infection; grey mould (*Botrytis cinerea*), also resistant to the low temperatures maintained in cold-storage plants; late scab (*Venturia inaequalis*), brown rot (*Sclerotinia* spp.), *Gloeosporium* rot (*G. fructigenum* [*Glomerella cingulata*], and *Gloeosporium album*), core fusariosis (*Fusarium avenaceum* and *F. lateritium*), which is prevalent chiefly on varieties with long, open stylar tubes (the channels of infection), e.g., Åkerö, and extends outwards into the flesh at a temperature of 15° upwards or otherwise adverse conditions; bitter pit, one form of which, reminiscent of *Lygus* injury, especially on Charlamowsky, is at any rate associated with boron deficiency [*R.A.M.*, xx, p. 412]; and physiological disturbances due to chilling, freezing, and overmaturity.

These diseases may be combated by strict attention to orchard sanitation, careful sorting, and the provision of a cool (but not freezing), moderately damp place of storage (relative humidity 85 to 95 per cent.), which should be thoroughly cleansed and fumigated with sulphur at the rate of 4 gm. per cu. m. before use. During storage care should be taken that apples are equally spaced and all infected or over-ripe fruits eliminated as quickly as possible.

Cation (D.), Boyer (C. A.), & Robertson (C. W.). **Red stele root rot of Strawberries.** *Quart. Bull. Mich. agric. Exp. Sta.*, xxv, 3, pp. 235–242, 2 figs., 1943.

Red stele root rot of strawberries (*Phytophthora fragariae*), first observed in Michigan (Berrien County) in 1937, is now regarded as the most serious disease affecting the crop in the State. The present system of inspection and handling of strawberry plants in the early autumn of the first growing season does not permit the ready detection of traces of infection, and new arrangements for certification

for apparent freedom from red stele have accordingly been made by the Department of Agriculture. Two inspections will be made during the first season of cultivation, one in early June, when the characteristic symptoms are most apparent, and the second at the beginning of November, when the above-ground manifestations of the disease should be recognizable. On the basis of the latter findings, the certification of suspected plants will be withheld until the early May examination, when confirmatory symptoms will have developed.

Alencar (J.). **Notas sobre o entomosporiose na Ameixa Amarela (Eriobotrya japonica Lindl.).** [Notes on entomosporiosis of the Loquat (*Eriobotrya japonica* Lindl.).]—*Ceres, Minas Geraes*, iii, pp. 117–120, 2 figs., 1942.

This is the first report of *Entomosporium maculatum* [*Fabraea maculata*] on the loquat in Minas Geraes, Brazil, though the same host is often severely attacked in São Paulo [*R.A.M.*, xix, p. 30]. Control may be effected by spraying the plants, during the production of new growth, with 1 per cent. Bordeaux mixture plus a casein spreader.

Montgomery (H. B. S.) & Shaw (H.). **Behaviour of thiuram sulphides, etc., in spore germination tests.**—*Nature, Lond.*, cli, 3829, p. 333, 1943.

About seven years ago the authors observed that in certain tests the toxicity of tetramethylthiuram monosulphide to the spores of *Venturia inaequalis* decreased as the concentration of the fungicide increased [cf. *R.A.M.*, xxi, p. 72]. The same effect was noted with tetramethylthiuram disulphide. It is now reported that this property of 'inversion of toxicity' is shared by other thiuram sulphides and some dithiocarbamates, namely, dimorpholyl thiuram monosulphide, dipentamethylenethiuram mono- and disulphides, sodium diethyl-dithiocarbamate, sodium and zinc morpholyl-dithiocarbamates, and sodium and piperidine pentamethylene-dithiocarbamates, and is probably a general property of these groups, which has remained unnoticed in some cases because the range of concentration within which it occurs has not yet been located. It is thought that the explanation of this behaviour may most likely be found in the chemical reactions of these notoriously labile substances.

Moore (W. C.). **New and interesting plant diseases.**—*Trans. Brit. mycol. Soc.*, xxvi, 1–2, pp. 20–23, 1943.

Fusarium moniliforme [*Gibberella fujikuroi*] was isolated from maize seedlings grown by a London commercial firm in nutrient solutions, on which mould had been observed to develop. Washing the seed well with water and soaking it in a solution of potassium sulphide (½ oz. per gal. water) for 16 hours retarded, but did not prevent, mould development. On the other hand, heating the previously soaked seed to a temperature of 54° C. for 20 minutes successfully eliminated *G. fujikuroi*, although it had little or no effect on the subsequent development of *Penicillium* in the sprouting cabinets.

A species of *Penicillium* was isolated in 1941 from lesions and rotted tissue of bulbs of *Scilla patula excelsior* and *S. hispanica alba* grown in Buckinghamshire. The rot, which affected some 10 per cent. of a total of 8,000 bulbs, was characterized by large, lateral, sunken lesions up to ¾ in. across, often coalescing, although occasionally the basal plate only was affected. The diseased areas were frequently completely covered with a copious growth of the fungus or, in its absence, the lesions were pale brown and the outer skin puckered into yellow folds or blisters. In some bulbs the rot was superficial, extending only about ⅛ in. in depth, the collapsed cells forming a buff-coloured, spongy layer; in others it was wet, soft, dark brown, and deep. The pure culture of the isolated fungus, which produced numerous very characteristic blood-red drops on Czapek's agar, was identified by G. Smith as a strain of the *corymbiferum-hirsutum* group. These two forms are

regarded by Smith, in accordance with Thom's opinion, as different strains of the same species. The original description of *P. hirsutum* Dierckx (1901) is, according to Thom, worthless, but since an adequate description, apparently based on authentic material, was later supplied by Biourge (1923), it is suggested that the correct name for the fungus in question is *P. hirsutum*, despite the fact that *P. corymbiferum* Westling (1911) antedates Biourge.

Examination of a few diseased bulblets of white garlic sent to the author in 1942 by C. J. Hickman from a consignment from the Argentine, showed that the symptoms of the disease and the characters of the fungus growing on the surface of lesions agreed closely with the disease caused by *Helminthosporium allii* in Italy [*R.A.M.*, iv, p. 325]. The unidentified species of *Pleospora* found in Italy on plants attacked by *H. allii* was not observed on the diseased material examined.

Moore (W. C.). **The measurement of plant diseases in the field. Preliminary report of a sub-committee of the Society's plant pathology committee.**—*Trans. Brit. mycol. Soc.*, xxvi, 1–2, pp. 28–35, 1 fig., 1 graph, 1943.

Over 1,200 estimates of disease intensity were received in 1941 by the sub-committee of the British Mycological Society's Plant Pathology Committee, in response to its appeal to various plant pathologists to collaborate in testing the methods of recording disease quantitatively in the field, proposed by the sub-committee for standardization. Observations were invited on six diseases important in war time, namely, loose smut of wheat [*Ustilago tritici*], blight (*Phytophthora infestans*) and virus diseases of potato, virus yellows and downy mildew [*Peronospora schachtii*] of sugar beet, and brown rot [*Sclerotinia fructigena*] of apple, and also on take-all (*Ophiobolus graminis*) and eye spot (*Cercosporella herpotrichoides*) of wheat, and apple scab (*Venturia inaequalis*). The same general procedure was recommended for potato, sugar beet, and wheat: two traverses to be made and ten samples taken on each traverse, one sample of potato or sugar beet consisting of ten consecutive plants in a drill (the ten samples to be taken at convenient distances along the diagonals of the field) and one of wheat consisting of two 1 yd. lengths of drill row, consecutive but in adjacent rows. To avoid unnecessary damage to the crops, the traverses were to be made in the direction of drilling instead of along the diagonal, beginning from the side of the field at points $\frac{1}{5}$ and $\frac{4}{5}$ of the width of the field, taking the first sample not less than 15 paces from the edge of the field, the observer side-stepping three paces after each sample and then proceeding along the row to the next sampling place. With all diseases except potato blight it was considered sufficient to record the numbers of infected and healthy plants or tillers in each sample; for potato blight each plant in the sample was to be given a symbol from 0 to 6, depending on the number of spots present on the leaflets or, at the higher levels, on the amount of leaf area destroyed. Brown rot of apple was to be recorded about a fortnight before harvest, taking a count of the number of affected apples among 50 fruits chosen at random from each of ten trees taken at random. Apple scab observations were to be carried out in July, collecting a minimum of 500 leaves by picking 50 at random from each of 10 trees scattered through the orchard, the leaves to be graded by means of the Tehon scale.

The results showed that the earliest record of potato blight was from Cornwall (28th July). From the records obtained it was possible to list potato varieties according to their susceptibility to blight. It was also shown that, in general, blight was slightly worse on crops grown from once-grown English seed than from fresh Scotch.

On the basis of experience obtained during 1941, the sampling methods were modified in many respects. The number of disease categories were reduced; only crops with more than 1 per cent. of disease needed to be sampled; and, in addition, rapid visual methods for determining this level were proposed. It is hoped that

observations made during 1942 will give further indications of possible improvements towards evolving standard methods of sampling.

Bisby (G. R.) & Ainsworth (G. C.). **The numbers of fungi.**—*Trans. Brit. mycol. Soc.*, xxvi, 1–2, pp. 16–19, 1943.

The authors give the approximate number of genera and species of fungi described up to 1940 [cf. *R.A.M.*, xii, p. 579], indicating the numbers accepted as good by competent authorities. The grand total of all good species amounts to 37,500, but it is suggested that this figure, although fairly conservative, is still too large in two respects: (1) a third of the Fungi Imperfecti have probably named perfect stages (proved or unproved, known or unknown), and (2) many species are not based on morphology alone, but on their hosts as well. It is estimated, therefore, that the total number of known good species is about 34,000, of which about 25,000 are based on morphology. The number of species known is estimated to represent about one-third of all existing fungi, of which there are probably about 100,000. The total number of genera proposed up to 1940 exceeds 7,000, 47·2 per cent. of which are monotypic. It is suggested that probably not more than one out of two proposed new genera, and not more than one out of three new species, is valid, and it is felt that a competent study of old genera and species, with much elimination, is badly needed. The number of species of fungi (including Myxomycetes) recorded from Britain is 9,000, out of which about 6,000 are considered good. It is suggested that a new enumeration of British Fungi be started, based only on such specimens as can now be found, definitely identified, and preserved in available herbaria.

Ken Knight (G.). **Studies on soil Actinomycetes in relation to Potato scab and its control.**—*Tech. Bull. Mich. agric. Exp. Sta.* 178, 48 pp., 1941. [Received May, 1943.]

Of the numerous inorganic and organic chemicals tested on heavily infested soils in Michigan for potato scab (*Actinomyces scabies*) control, none gave promise of practical utility and the mercury compounds even seriously aggravated the trouble in a number of experiments. Investigations were then carried out to determine the cause of the conflicting results reported in the relevant literature on the effect of mercury compounds as soil treatments on potato scab. The trials comprised field and pot soil treatments, studies on the relative tolerance of *Actinomyces* from different sources of mercuric chloride in nutrient solutions, dilution-plate counts of micro-organisms from mercury-treated soils, and observations on factors affecting the evolution of mercury vapour from compounds of the chemical by the use of a test organism (*A.* No. 6 from eggplant) for the detection of minute quantities of the vapour.

The primary reason for the discrepancies in question was shown to lie in the wide variation of the parasitic Actinomycetes in their tolerance of mercury compounds. In a nutrient solution, isolates from England and Long Island, for instance, were less tolerant of mercuric chloride than were similar Michigan strains, some of which withstood a concentration of the compound more than 100 times as high as that required to kill the more sensitive isolates from regions where soil treatments are successful. Calomel [mercurous chloride] controlled scab both in Long Island and local (East Lansing, Michigan) soils artificially infested with Long Island strains, whereas the same treatment caused an increase of infection in both soils inoculated with Michigan Actinomycetes. The data from dilution-plate counts indicated that mercurial soil treatments, in soils infested with local Actinomycetes, effected an initial reduction in the number of the latter, but that those capable of tolerating the chemical subsequently multiplied, presumably as a result of the reduced competition on the part of other micro-organisms.

Mercury vapour apparently reacted with ingredients in the nutrient agar to

produce substances toxic to micro-organisms, but in a dry state, or in pure water, the spores even of the most sensitive *A.* No. 6 sustained no injury from this source. The mixture of powdered zinc with mercury compounds appeared to accelerate the vaporization of mercury from the latter: on the other hand, oxidizing agents, especially potassium permanganate, mixed with mercury compounds reduced the rate of evolution of the vapour. One part of potassium permanganate to 1,000 of yellow oxide of mercury counteracted the lethal effect of the latter on the test organism in sealed containers. This phenomenon could be demonstrated without actually mixing the potassium permanganate with the mercurial or even placing the chemicals in close proximity, the affinity between them operating both in the dry and wet state, as well as in the soil.

The vapour from yellow oxide of mercury easily traversed 6 in. of sandy soil but not loam, clay, or muck, though when 0·1 gm. of the compound was mixed with 25 gm. of loam and covered with 6 in. of loam the vapour came through. The admixture of acids with mercurials prevented the evolution of the vapour. Under field conditions hydrochloric acid (1,500 lb. per acre) applied with mercurous chloride exerted no lasting effect on the soil reaction and none on the tendency of the mercurial to increase scab, which was reduced, on the other hand, by the use of sulphur with mercurous chloride, the former being given time to oxidize.

Mercurous chloride as a soil treatment increased the incidence of scab on beet and eggplant roots, but not on those of radish, turnip, or swede, combinations of lime with the mercurial being more effective than the latter alone in the aggravation of such injury.

In trials over a three-year period 21 bacterial isolates, 41 Actinomycetes, including *A. praecox*, *A. viridis*, and *A. setonii*, seven fungi (*Pythium* sp., *Trichoderma lignorum* [*T. viride*], *Fusarium* [*bulbigenum* var.] *lycopersici*, *Alternaria* sp., *Mucor mucedo*, *Dendryphium* sp., and *Rhizopus batatas*), and two yeasts, added to scab-infested soils on various media, failed to control the disease, significant increases in which were caused by green manures of bluegrass [*Poa pratensis*] and lucerne and other forms of organic matter.

Various difficulties precluded an altogether satisfactory outcome of the pathogenicity tests carried out with pure cultures of Actinomycetes, but apparently several species or races of *Actinomyces* were pathogenic to Katahdin potato tubers, the most virulent being *A. viridis* and the isolates from beet, turnip, and Warba potatoes. The host range of the Actinomycetes concerned in scab production was shown to include eggplant, *Solanum nigrum*, *Brassica arvensis*, and *Amaranthus retroflexus*, and possibly other plants.

A bibliography of 87 titles is appended.

Proceedings of the Association of Applied Biologists.—*Ann. appl. Biol.*, xxx, 1, pp. 80–108, 6 graphs, 3 diags., 2 maps, 1943.

At a joint meeting of the Association of Applied Biologists and the British Mycological Society in 1942, a discussion was held on potato virus diseases. In an introductory paper G. Samuel (pp. 80–82) stated that every year, over 300,000 tons of Scottish and Irish seed potatoes are imported into England, and in two or three years almost the whole of this seed has been discarded. No other form of plant disease causes such tremendous destruction in Britain. Under present conditions, the importation of fresh seed from Scotland and Ireland offers the easiest means of control. The standard of certification was raised in 1937 to permit not more than 0·5 per cent. of leaf roll and severe mosaic, and not over 1 per cent. of all readily visible virus diseases. This has stimulated roguing, many farmers now hiring professional roguers, and in the absence of appreciable insect transmission it has resulted in a definite improvement of stocks. Over 20,000 acres reach this higher grade annually. The highest grade Stock Seed Certificate requires not more than

0·25 per cent. of visible virus disease, with fewer than four plants per acre (about 0·025 per cent.) showing leaf roll or severe mosaic. Some of this highest grade seed is bought by ware growers in England, and planted in counties where it degenerates in a year. Seemingly, it would be more economical to keep the seed in Scotland.

While the position as regards leaf roll and severe mosaic (virus Y) in Scottish and Irish seed is good, it is less satisfactory as regards mild mosaic (virus X) which is present throughout most stocks of certain varieties; in some circumstances it may reduce yields by 16 to 40 per cent. The chief problem now is how to multiply stocks from tested X-free tubers on a large commercial scale.

The other part of the potato virus problem is how to make good seed last as long as possible when brought to England for ware-growing. The rapid degeneration in south-eastern England is almost wholly due to the spread within the stocks of leaf roll and virus Y. The Ministry of Agriculture and Fisheries has instituted a scheme for the certification of 'once-grown' seed. The parent stock must be good Scotch, Irish, English, or Welsh seed-growers' association stock containing under 3 per cent. leaf roll and severe mosaic and over 50 yds. distant from other, affected potatoes [*R.A.M.*, xx, p. 131].

F. C. Bawden (pp. 82–83) dealt with some properties of the potato viruses, leaf roll, X, and Y, of which the first is economically the most important, for while it may cause less reduction in the yield of individual plants than virus Y, it occurs much more often. Some of the relatively unimportant viruses are strains of X and Y, B and D being serologically related to X, and C to Y. In the field it is common for one of the aphid-transmitted leaf roll and Y viruses to spread considerably while the other does not, or for one to spread at one period and the other at another time. These two viruses are responsible for the rapid degeneration of potato stocks in the south and east of England, and seed from Scotland and Ireland is superior because relatively free from them. Except, however, for those varieties that die when infected with the more prevalent strains of X, such seed is generally widely infected with X, which appears to spread as easily in Scotland and Ireland as it does in England.

K. M. Smith described practical difficulties in the production of virus-free seed potatoes (pp. 84–85). He stated that in his work at the Plant Virus Research Station, Cambridge, difficulty is experienced in securing virus-free material of new potato varieties. Another trouble is that virus X is often found in potato plants which have been already carefully tested and have never left the glasshouse.

In tests for viruses in potato plants the author uses tobacco, *Nicotiana glutinosa*, and *Capsicum* plants, which react well to X and Y. For other viruses which are not sap-transmissible he uses grafting and a potato variety that develops conspicuous symptoms of the virus under test. Most testing is done in spring. Insects are kept under control by constant fumigation. Stock maintenance demands unremitting vigilance and routine testing. The real difficulties begin when the attempt is made to multiply glasshouse stocks outdoors. No method of isolation has proved successful. For the present the attempt to multiply the author's virus-free stocks in England has been abandoned, the glasshouse stocks being grown in isolation in Northern Ireland. When sufficient stocks have been built up they will be passed on to the seed trade.

T. Whitehead discussed factors affecting the health of seed-potato stocks growing under a scheme that has been in operation in North Wales for 15 years (pp. 85–96). The evidence obtained during this period demonstrated the value of continuous aphid and virus disease records and proved that an intimate connexion exists between aphid infestation and potato degeneration. It also showed that a national survey along these lines would be justified on both scientific and practical grounds. The author recommends that, in the absence of effective field control of aphids, (*a*) Class 1 Certificates should be confined to good seed-growing areas;

(*b*) a parentage of less than 1 per cent. total virus disease from Class 1 areas only should be required before a stock is inspected for certification; (*c*) stock certification in areas with early and high aphid counts is scientifically unjustifiable; (*d*) deficiencies in good seed stocks available for sale should be made up by encouraging the planting of small ware or chats from the best seed-growing districts: certificates of doubtful value should not be issued to stocks in other, less suitable localities; and (*e*) as a war emergency measure for reducing transport, County War Agricultural Committees should be encouraged to plant good seed in selected areas for use as seed in the county.

P. H. Gregory discussed the spread of potato virus diseases in the field (pp. 104–105). He stated that in 1940 and 1941 the amount of spread round secondary leaf roll plants varied enormously in different fields, even when only a few miles apart, and concluded from his results that the identification and counting of aphids present on a potato crop will not of themselves enable predictions to be made about the health of the progeny. Local factors controlling the movement of the insects are also important. Investigation of the spread of virus between potato fields showed that with increasing distance from a badly diseased stock the amount of virus infection passing over to a healthy stock fell off steeply at first, the curve then flattening out.

In conclusion, G. Cockerham discussed potato breeding for virus resistance (pp. 105–108). Some form of resistance (or tolerance in the case of Y) exists to the viruses X, Y, A, and leaf roll among cultivated varieties of potatoes, and each form is controlled by heritable factors. The possibilities of even more useful forms of resistance in 'wild' material are coming to light, and there is considerable probability that a fair measure of control may result from the introduction of varieties more resistant than those cultivated at present.

Norris (D.) & Bald (J. G.). **Transmission of spotted wilt through Potato tubers.**—*J. Aust. Inst. agric. Sci.*, ix, 1, pp. 34–35, 1943.

In February, 1941, single tubers were harvested from Factor potato plants affected with spotted wilt [*R.A.M.*, xxi, p. 244] in New South Wales. In December of the same year a portion of each was planted in the greenhouse. Of 51 germinated index pieces 16, or 31 per cent., developed symptoms of the disease, the others producing healthy plants. Of the affected plants some collapsed in two or three weeks; four survived for eight weeks or more.

Thirty-three of the indexed tubers from which these plants were grown were set in the field in very dry, hot conditions. Sixteen grew, of which three produced diseased plants which were still living two months after they had been planted.

The evidence thus shows that plants from infected tubers in the field may survive long enough for thrips larvae to acquire the virus, pupate, and emerge as infective adults able to transmit the virus to healthy potatoes. Such plants are a likely source of infection wherever the disease occurs in potato crops. As, however, a generation of thrips must develop on affected plants before transmission can occur in the current season, new infections from these internal sources will not appear for about six or eight weeks after emergence. Symptoms from external sources may develop at any time from about two weeks after emergence, as this is about the incubation period of the virus in the plant.

Tuber transmission in the field is not likely to give rise to many infection centres in a crop from good-quality seed, because the seed tubers showing the typical distortion and cracking caused by spotted wilt would be removed, and of those left only a small proportion would give rise to affected plants. No great reduction in the yield of ordinary table potatoes is likely to result from infection arising from these primary centres within the crop. Heavy losses are experienced locally chiefly in coastal and suburban localities, where garden plants and weeds are present in

abundance. In certification, however, the disease must not be ignored as non-transmissible through the tuber. Diseased plants should be rogued and a maximum tolerance fixed.

Bald (J. G.). **The effect of zinc oxide on the cut surfaces of Potato tubers.**—*J. Aust. Inst. agric. Sci.*, ix, 1, p. 35, 1943.

After pointing out that many materials used to disinfect the cut surfaces of seed potatoes before planting prevent suberization, the author states that when zinc oxide was sprinkled on wet sand on which the exposed surfaces of cut tubers were placed, after a week or more at about 70° F. the surfaces were quite clean, and as well suberized as those of the controls lying on wet sand alone. Other controls on sand wetted with Cheshunt mixture failed to suberize.

In a further test, 2 to 3 cwt. of cut seed tubers of the Up-to-Date variety were treated by dipping the exposed surfaces in a suspension of zinc oxide before the setts were planted, the tubers being cut, treated, and planted on the same day. Emergence followed promptly and reached 98 per cent. At late flowering, when large tubers had formed, the seed pieces were still sound.

Odehnal (J.). **Die Feststellung der in ihrer Vitalität abgeschwächten Knollen bei Kartoffelsaatgut mit Hilfe der Luminescenz im ultravioletten Lichte.** [The identification of seed Potato tubers with impaired vitality by means of luminescence in ultra-violet light.]—*Ann. Acad. tchéchosl. Agric.*, xvi, pp. 218–224, 1941. [Abs. in *Chem. Zbl.*, cxiii (i), 2, p. 279, 1942.]

The presence of certain types of disease or other defects resulting in the impaired vitality of potato tubers may be rapidly and reliably ascertained by exposure to the 'Tatra' quartz lamp. Under the influence of the ultra-violet rays tubers infected by *Rhizoctonia* [*Corticium*] *solani*, for instance, develop a blue fluorescence, which is likewise characteristic of those injured by freezing or softened by wilting in warm districts. Normal healthy tubers respond to illumination by a dark grey-green or yolk of egg-coloured fluorescence; those of the summer harvest in low-lying, unfavourable situations turn pale yellow on exposure to the rays, while the autumn crop in the same districts shows the blue coloration associated with defective material. Boiling does not destroy the fluorescence, but it disappears under formalin treatment.

Exner (Beatrice) & Chilton (S. J. P.). **Cultural differences among single basidiospore isolates of Rhizoctonia solani.**—*Phytopathology*, xxxiii, 2, pp. 171–174, 1 fig., 1943.

Further details are given of the variations in potato dextrose agar cultures at 28° C. between ten single-basidiospore isolates of *Rhizoctonia* [*Corticium*] *solani*, four from Lima bean [*Phaseolus lunatus*], two from alligator weed (*Alternanthera phylloxeroides*), and four from potato, a preliminary note on which has already appeared [*R.A.M.*, xxii, p. 223]. For example, the growth rate from the 24th to 48th hour of 21 cultures of the fungus from a basidial mat on *P. lunatus* ranged from 26·3 to 37·2 mm., and comparable differences were observed among the isolates from the other hosts.

Schaal (L. A.) & Edmundson (W. C.). **Late blight of Potatoes in Colorado.**—*Amer. Potato J.*, xx, 4, pp. 86–88, 1943.

The occurrence of potato late blight (*Phytophthora infestans*) for the first time in Colorado in 1941 has already been recorded [*R.A.M.*, xxi, p. 500]. The disease was also observed by the present writers near Gilcrest in July of the same year, and again in 1942, infection being mild in both seasons and unaccompanied by tuber rot, which was, however, observed in a severe form in the northern part of

the State, in some cases with little or no corresponding vine infection. Generally speaking, the rot was most prevalent on tubers lowest in the 'hill' and in those nearest to the irrigation trench, denoting that the conidia were disseminated by the irrigation water rather than conveyed to the surface of the tubers by rain.

The hot, dry days and cool, dry nights characteristic of Colorado summers are not conducive to the development of *P. infestans*, the outbreak of which in 1942 is attributed to the exceptional occurrence in an otherwise normal season of protracted periods of fog on eight days in August, which afforded ideal conditions for infection [ibid., xviii, p. 815]. Moreover, a heavy snowfall during the preceding winter (one of the coldest on record) prevented the freezing of the soil and permitted the growth of numerous 'volunteer' potato plants in the spring, some of which may have provided the initial inoculum for the epidemic of 1942.

The harvesting and storage of the diseased tubers in northern Colorado constituted a serious problem. The rot is difficult to detect on the red Bliss Triumph tubers, of which part of the crop consisted, so that diseased material was inadvertently stored instead of being discarded in the field. Cool storage was impracticable owing to the high prevailing temperatures during the first few weeks, and soft-rot organisms invaded the blighted tubers, causing a rapid breakdown in many cellars. Most of the severely rotted lots were sorted before 1st December, with a resultant loss of some 15 per cent. of the commercial crop.

Newman (A. S.) & Norman (A. G.). **The activity of subsurface soil populations.**—*Soil Sci.*, lv, 5, pp. 377–391, 1 graph, 1943.

Sub-surface soil samples (Marshall, Fayette, Marion, Clarion, and Clinton silt loams and Shelby and Lindley loams) were investigated at the Iowa Agricultural Experiment Station and found to contain smaller, less versatile, and less adaptable microbiological populations than those occupying the superficial strata. Introduced plant material is less rapidly and extensively decomposed, presumably owing to the presence in the lower layers of antibiotic or inhibitory substances of microbial origin. The alcohol extract from surface soil samples (3 gm.) of Clarion silt loam significantly decreased the growth of *Penicillium humicola*, *Aspergillus sydowi*, *Zygorrhynchus vuillemini*, *Sporotrichum pruinosum*, and *Monilia humicola* in pure cultures on Waksman's fungal medium, a similar effect being exerted on all except *Z. vuillemini* by the extract from 1 gm. of the same soil. The same organism was definitely stimulated by the alcohol extract from 3 gm. of Marshall silt loam, which adversely affected the development of all the other moulds included in the tests.

Report on Forest Administration in the Mysore State for the year 1940–41.—244 pp., Bangalore, Govt Press, 1942.

The following reference of phytopathological interest occurs in this report (p. 11). Sandal [*Santalum album*] spike continued to be prevalent in parts of the Bangalore, Tumkur, Hassan, and Mysore districts, and a new centre of infection was observed in the Nandi Hills. The first few trees affected by the disease were detected in August in an area cleared and burnt for the establishment of plantations, and within a few months extensive spread had taken place from west to east, in the direction of the wind. Control measures, in the form of girdling and treatment with Atlas tree-killer [*R.A.M.*, xvi, p. 710] of all trees within the infected zone, were promptly undertaken.

Jenkins (Anna E.). **Gloeosporium pestiferum, a synonym of Elsinoe ampelina.**—*Trans. Brit. mycol. Soc.*, xxvi, 1-2, pp. 50-52, 1 pl., 1943.

On the basis of an examination of the original specimen of *Gloeosporium pestiferum* (F. M. Bailey 881) from the Herbarium of the Government Botanist,

Brisbane, Queensland, and from a review of the pertinent literature, the author concludes that the fungus is in fact *Elsinoe ampelina*.

Rogers (D. P.). **The genus Pellicularia (Thelephoraceae).**—*Farlowia*, i, 1, pp. 95–118, 118 figs., 1943.

This is a critical discussion of the genus *Pellicularia* Cke, synonyms of which are *Corticium* section *Botryodea* Bourd. & Galz. 1911, *Tomentella* section *Tomentellastrum* subsection *Botrytes* Bourd. & Galz. 1924, *Botryobasidium* Donk 1931, and *Botryohypochnus* Donk 1931. In addition to the type species, *P.* (*C.*) *koleroga* (*C. stevensii*), 15 are described, of which four are new and six are new combinations; *C. album* Dastur [*R.A.M.*, xix, p. 529] probably belongs to *Pellicularia*.

P. koleroga, an occupant of the under side of orange, coffee, persimmon, *Pittosporum*, and pear leaves, is characterized by obpiriform, short barrel-shaped, rarely short clavate basidia, 11·5 to 15 or 19·5 by 8·5 to 10 μ, bearing four horn-like sterigmata, 6 to 8 by 2 to 3 μ, and subcylindrical to elongate-subellipsoid, laterally apiculate spores, 10·5 to 16 by 3 to 5·5 or 7 μ. Although there is considerable variation in the shape of the spores, which in the Puerto Rican collection on coffee, for instance, are slender, subfusiform, and slightly curved, the differences are not considered to afford an adequate basis for specific separation, and Wolf and Bach are followed in their combination of *C. stevensii* with *C. koleroga* [ibid., vii, p. 247].

Synonyms of *P. filamentosa* (Pat.) comb. nov. are *Hypochnus filamentosus* Pat. 1891, *H. solani* Prill. & Del. 1891 [ibid., iv, p. 184], *C. vagum* var. *solani* Burt *ex* Rolfs 1903, *C. solani* (*Prill. & Del.*) Bourd. & Galz. 1911, *C. vagum sensu* Burt 1918 p.p., *C. vagum* subsp. *solani* (Prill. & Del.) Bourd. & Galz. 1928, *Botryobasidium solani* (Prill. & Del.) Donk, *C. areolatum* Stahel 1940 [ibid., xix, p. 341] nec *C. areolatum* Bres 1925, *Oidium citri* Bondar 1929 (*nomen nudum*), and *C. microsclerotia* Weber 1939 (*nomen nudum*) [ibid., xix, p. 3]. The fungus, which occurs on the living foliage or stems of *Boerhaavia erecta*, *Chimaphila maculata*, *Citrus* spp., carnation, fig, *Hydrophyllum virginicum*, tobacco, *Solanum dulcamara*, and potato, is characterized by subcylindrical, barrel-shaped, or obpiriform, clavate basidia, formed on the subbasidial hyphae in small, imperfectly symmetrical cymes, 10 or 12 to 18 or 23 by 8 to 11 or 12·5 μ, bearing four horn-shaped sterigmata, 3 or 5·5 to 12 or 20 by 1·5 to 3·5 or 4·5 μ, and ellipsoid or oblong-ellipsoid, truncate to apiculate spores, 7 to 12·5 by 4 to 7 μ, occasionally germinating by means of a stout promycelium carrying a similar secondary spore. It is distinguishable from the saprobic species by the flattened-ellipsoid spores with a peculiar truncate, almost jagged apiculus, by the four, usually long and thick sterigmata, and by the small and usually imperfect cymes of basidia. Though differentiable on morphology alone, the substratum, namely, parts of living plants or occasionally soil in contact with them, is the easiest diagnostic character.

The diseases associated with the various fungus names listed in synonymy seem distinct enough but the fungi show relatively slight variation. *C. areolatum* has the smallest spores (7·5 to 9 by 4·5 to 5 μ) whilst the type of *H. filamentosus* lies near the upper end of the spore range. The sclerotial stage of *P. filamentosa* has been described as *Rhizoctonia solani* and *R. microsclerotia*; Weber's name, *Corticium microsclerotia*, for the perfect state of the latter is regarded as a *nomen nudum*. It is possible that on different hosts and under varying circumstances a single pathogen may give rise to different pathological phenomena, but it would appear desirable to admit taxonomic segregation within the pathogen only when significant differences have been shown to exist between the fungi themselves; so far such differences have not been revealed.

The taxonomic classification of *P. vaga* (Berk. & Curt.) Rogers ex Linder 1942, prevalent in North America on the wood and bark of hard and soft woods, is complicated both by the variability of the fungus itself and the confusion introduced

by its identification by various authors with *P. filamentosa*. There is no important variation in gross appearance, in hyphae, or, except for dimensions, in basidia but the spores of *P. vaga* are navicular, 7·5 to 12 or 17 by 2·5 or 3·5 to 5 or 5·5 μ.

Four species included by Bourdot and Galzin in the section *Botryodea* of *Corticium* are excluded from *Pellicularia*. A key to the species of the latter genus is given.

Seeler (E. V.). **Several fungicolous fungi.**—*Farlowia*, i, 1, pp. 119–133, 2 pl., 1943.

This is a critical discussion, amplified by geographical and bibliographical annotations, of three genera of fungal hyperparasites, namely, *Eleutheromyces* Fckl emend. Seeler, *Micropyxis* Seeler n.g., and *Sphaeronemella* Karst. emend. Seeler, represented by one species each, viz., *E. subulatus* on agarics and polypores, *M. geoglossi* (Ell. & Ev.) Seeler n. comb., and *S. helvellae*. *Eleutheromycella mycophila*, growing on *Polystictus versicolor*, closely resembles *Eleutheromyces subulatus*.

Drechsler (C.). **Two species of Pythium occurring in southern States.**—*Phytopathology*, xxxiii, 4, pp. 261–299, 16 figs., 1943.

Detailed notes are given on *Pythium myriotylum*, a parasite of economic plants in certain southern States, and *P. ostracodes* n.sp., isolated from wheat roots in Texas, is fully described.

P. myriotylum is subject to attack by *P. acanthicum*, *P. periplocum*, and *P. oligandrum* [*R.A.M.*, x, p. 211; xviii, p. 650; xxii, p. 216], though in a less destructive form than the well-known pathogens, *P. ultimum*, *P. de Baryanum*, and *P. irregulare*. The three echinulate parasites emit numerous branches that invest the hyphae of *P. myriotylum*, in some places merely inducing noticeable abnormality, in others causing local disintegration of the protoplasmic contents, and elsewhere again intruding assimilative elements into the interior of the host. The hyphae of *P. ostracodes* are often more elaborately enveloped by the parasitic species than *P. myriotylum*, but without sustaining noteworthy damage. Moreover, the hyphae of *P. myriotylum*, *P. ostracodes*, and many other *P.* spp., are liable to complicated envelopment by such root-rotting members of the Saprolegniaceae as *Plectospira myriandra* [ibid., vi, p. 517] and the three strains of *Aphanomyces cladogamus* isolated, respectively, from diseased pansy, spinach, and flax [ibid., viii, p. 606]. In these cases, however, the relationship between the attacking fungi and their hosts appears to be antagonistic rather than actively parasitic.

Middleton (J. T.). **The taxonomy, host range and geographic distribution of the genus Pythium.**—*Mem. Torrey bot. Cl.*, xx, 1, pp. 1–171, 17 figs., 1943.

The investigations fully described in this monograph—the most detailed and complete hitherto published on the genus *Pythium*—are based on a collection of over 2,000 cultures from various parts of the world, representing most of the known species.

The smooth or echinulate character of the oogonial wall are specific criteria, which have been utilized for purposes of classification, but the ranges and means of 200 oogonia of each species measured were so closely similar, in fact often identical, as to be quite devoid of taxonomic value. Other specific features are the origin and morphology of the antheridium, the plerotic or aplerotic condition of the oospore and the thickness and type of its wall, and temperature-growth relations.

The abandonment of the subgenera *Aphragmium* and *Nematosporangium* and the sections *Orthosporangium* and *Metasporangium* is advocated, and the general discontinuance of the use of subgenera and sections in the genus *Pythium sensu* Pringsheim proposed. The presence or absence of a septum delimiting a sporangium is too variable a character to be of taxonomic validity, and the mode of

sporangial germination is largely determined by the conditions of the immediate environment, zoospore production almost invariably occurring when the organs are placed in fresh running water and germ-tubes being exclusively formed on agar cultures without additional moisture.

The mode of zoospore formation has served as the principal differential character for the separation of *Pythium* and *Phytophthora*, and may, with certain reservations, be retained for this purpose. Under appropriate environmental conditions, the sporangia of *Pythium* give rise to an emission tube capped by a vesicle into which the homogeneous contents of the sporangium pass, to be differentiated through a series of cleavages into zoospores, the latter being liberated by the rupture of the vesicle. In *Phytophthora* the zoospores are produced within the sporangium and released either through the disruption of its wall or the dissolution of the papilla, no vesicle being normally present. The amphigynous type of antheridium predominant in the genus *Phytophthora* is unique, and has not been observed in *Pythium*. The growth habits of the two genera, moreover, differ sufficiently for their separation to be effected on a general macroscopic basis. To sum up, although there is no single infallible standard for the generic segregation of *Pythium* and *Phytophthora*, a number of attributes exist to simplify their differentiation in practice. The generic principles followed in this study are those established by Butler (*Mem. Dep. Agric. India*, Bot. Ser., i, 5, 1907) and Miss Matthews (Studies on the genus *Pythium*, 1931), involving the retention of *Pythium* in its original broad sense.

The present treatise comprises a critical discussion of 66 species recognized by the author as valid, supplemented by remarks on 29 referred to the doubtful or invalid category, a key to the species, a glossary, a 25-page bibliography, and an index. Mention should also be made of the original figures.

Davis (J. J.). **Parasitic fungi of Wisconsin.**—ii+157 pp., [printed privately], Madison, Wisconsin, 1942.

This list of parasitic fungi of Wisconsin, arranged in systematic order with host and parasite indexes, constitutes a record of collections in the Herbarium of the University of Wisconsin, which includes the herbarium of the late J. J. Davis. The list also includes a compilation of reports by W. Trelease and the author, published in the *Trans. Wis. Acad. Sci. Arts Lett.* from 1885 to 1937.

Petch (T.). **British Nectrioideae and allied genera.**—*Trans. Brit. mycol. Soc.*, xxvi, 1–2, pp. 53–70, 1943.

This annotated list of British Nectrioideae, Patelloideae, and Stromaceae contains the following records of interest: *Polystigmina rubra* on leaves of *Prunus spinosa*, *P. insititia*, and plum; *Micropera spuria* on *P. spinosa* and plum; *M. padina* on cherry; *M. turgida* on ash; and, in the addenda, *Zythia fragariae* on pale yellowish-brown blotches with a narrow, dark purple border on leaves of strawberry.

Rawlins (T. E.). **Recent evidence regarding the nature of viruses.**—*Science*, N.S., xcvi, 2497, pp. 425–426, 2 graphs, 1942.

The author disagrees with Frampton's conclusion that tobacco mosaic virus particles may be composed of units 37 mμ long, joined end to end [*R.A.M.*, xxi, p. 307]. Measurements of the length of the tobacco mosaic particles in figures published by Anderson and Stanley [ibid., xx, p. 428] were made and the results subjected to statistical analysis. Both visual inspection and statistical treatment of the frequency curve of these length measurements indicate that there is small evidence of the larger particles being composed of shorter visible uniform units joined end to end. The lengths of the particles of the rib-grass [*Plantago lanceolata*] strain of tobacco mosaic virus were measured on the electron micrograph shown in fig. 2

of Holmes's paper [ibid., xxi, p. 227], a frequency curve of the lengths then being made. If the virus particles are molecules and the commonest length is the most probable value for the molecular length, in each virus there are many particles too long or too short for the difference to be due to errors in measurement and the longer particles do not consist of two or more molecules of the commonest length joined end to end.

That virus particles of a given rod-shaped virus have various lengths and that the longer lengths do not appear to be multiples of the most characteristic length would suggest that they are not molecules. In their variable length they resemble rod-shaped bacteria, while particles of a spherical virus, like most spherical bacteria, appear to have a relatively uniform diameter.

Berkeley (G. H.) & Phillips (J. H. H.). **Tobacco streak.** —*Canad. J. Res.*, Sect. C, xxi, 6, pp. 181–190, 2 pl., 1943.

Tobacco streak [*R.A.M.*, xxi, p. 516] was found for the first time in Ontario in 1937 and in Quebec in 1938, but there is reason to believe that it had been present in both provinces for some years. The percentage of infection in fields in both Ontario and Quebec is usually very low, but in two instances in the Blenheim-Ridgetown area 40 and 60 per cent., respectively, were encountered.

In greenhouse experiments in Ontario the virus causing streak was successfully transmitted by patch-grafting and juice transfers from tobacco to tobacco and to 11 other species of plants, namely tomato (by patch-grafting only), *Nicotiana glutinosa*, *N. rustica*, *N. sylvestris*, *N. langsdorffii*, *N. bigelowii*, *Nicandra physaloides*, *Datura stramonium*, *Antirrhinum majus*, *Calendula officinalis*, and *Phaseolus vulgaris* var. *humilis*. The incubation period of the virus was found to vary both with environment and with host, ranging on the average from 6 to 14 days after patch-grafting and from 4 to 10 days after juice transfer.

The primary symptoms produced on tobacco plants consisted of necrotic local lesions surrounded by concentric water-soaked lines or rings, which later became brown and necrotic. The necrotic lesions showed a tendency to spread along the veins, parallel necrotic lines appearing in the surrounding tissue, and sometimes to cause the collapse of the midrib and petiole. When numerous lesions and ring spots were present, the leaf turned yellow and died. The systemic symptoms appeared as a net pattern or sometimes as rings or partial rings with necrosis, at first brown but later greyish-white, closely associated with the veins and the bases of young leaves, although sometimes the bases of older leaves also showed typical necrotic lines, rings, or spots. The necrotic tissue often separated from and dropped out of the leaf; affected leaves were smaller than normal ones, and were narrow and slightly crinkled. Leaves may be affected on one side only, the midrib curling towards the affected side. No distinct mottle was observed, but a slight paling of the interveinal tissue may give a suggestion of mottling. On Turkish tobacco the recovered leaves may be coarsely toothed and a mild necrosis occasionally developed on the sucker growth; on the Burley varieties necrosis was more extensive and severe than on flue-cured varieties tested, the young leaves often dying before being fully developed. In the field, and on older plants in the greenhouse, necrotic streaking of the stem, consisting of dark, almost black, shiny, sunken lines, was commonly observed, especially on Burley varieties. Frequently the woody tissue under the discoloured area, and even the pith, was also brown; conversely the pith and woody tissue may be discoloured with no visible external symptoms. Often, particularly in Burley varieties, the necrotic streaking may extend to the growing point, causing the top of the stem to turn at a sharp angle to form a 'crooked top'. On tomato, necrosis varied in intensity from a few scattered areas to a severe type of scorch the most conspicuous symptoms being the large, black, sunken spots or rings commonly developing on the fruits and extending deep into the tissues. The

seed from such fruits had greatly reduced germinability, but plants grown from it were healthy.

The virus was killed in extracted juice at 53° C. for 10 minutes and in patch sticks at 55° for 5, but was still viable in patch sticks after 15 minutes at 50°. The virus ceased to be viable in extract after 24 hours or less at room temperature. In experimental plots planted in 1939 and 1940, no mechanical spread of the disease was observed. The virus did not appear to overwinter in soil under Ontario conditions.

The virus was successfully transmitted from sweet clover [*Melilotus* sp.] to tobacco, and a disease resembling streak was induced in sweet clover by the transfer of the virus from tobacco. It is not known whether the disease in sweet clover was caused by one virus or a mixture of viruses, as the authors were unable to transmit any one source of tobacco streak from tobacco to sweet clover and back again or vice versa. Nevertheless, the experimental results obtained, supported by circumstantial evidence available, are taken to indicate that sweet clover is a host of the virus. All the evidence is stated to suggest that streak is spread to tobacco by insects from neighbouring weeds and possibly sweet clover, and control measures should, therefore, aim at the destruction of weeds in close proximity to tobacco, and the location of tobacco fields as far removed from sweet clover as possible.

SPENCER (E. L.) & PRICE (W. C.). **Accuracy of the local-lesion method for measuring virus activity. I. Tobacco-mosaic virus.**—*Amer. J. Bot.*, xxx, 4, pp. 280–290, 1943.

To test the accuracy of the local-lesion method (developed by Holmes in 1929 [*R.A.M.*, viii, p. 532]) for the estimation of the activity of an 'unknown' virus solution in terms of a standard preparation of the same virus, the authors conducted a series of experiments using the Early Golden Cluster bean as a test plant, and clarified juice of Turkish tobacco plants affected with mosaic as the virus solution. It was postulated from the outset that in determining the relative concentration of two virus samples it is necessary to measure not only the numbers of lesions produced by either, but also the rate at which the number of lesions decrease when the samples are diluted, that is, the slope of the dilution curve. The best results were obtained by comparing two dilutions of each of the standard preparation and the unknown solution on opposite halves of paired leaves of the same individual plants, choosing dilutions in such a way that the most concentrated of the two produced from 15 to 35 lesions per half leaf. Greater accuracy resulted from adjusting the concentrations of the standard preparation as closely as possible to those of the unknown solution; for that purpose, the approximate concentration of the latter was determined prior to the actual experiment. By using the experimental procedure outlined above it was possible to determine the activity of the unknown solution of virus with an error not exceeding 10 per cent. Limited tests indicated that using three dilutions of each sample instead of two gave sometimes more and sometimes less accurate data, while with five instead of three less reliable results were obtained.

MCKINNEY (H. H.). **Studies on genotypes of Tobacco resistant to the common-mosaic virus.**—*Phytopathology*, xxxiii, 4, pp. 300–313, 1943.

Comparative studies were carried out at Arlington Farm, Virginia, on several tobacco genotypes to determine (*a*) the differences in the amounts of the common mosaic virus produced therein, and (*b*) the effects of plant age on virus synthesis and movement.

In 1937–8 a total of eight tobacco collections displayed no visible signs of infection, and three of these, T.I. 448A [*R.A.M.*, xxii, p. 81], T.I. 450, and T.I. 1110B,

yielded no virus in the upper leaves late in the season, whereas some plants of the remaining five, viz., Ambalema, T.I. 320, T.I. 384A, T.I. 470A, and T.I. 472A3 contained infective material in comparable leaves. T.I. 448A was the only selection to yield no virus from the foliar samples collected midway between the bases and tops at an advanced date. Of the resistant types Ambalema carried the largest quantity of virus in these leaves.

Most of the further experiments were conducted in the greenhouse with T.I. 448A, Ambalema, and the susceptible Wisconsin-Havana Seed. The results clearly showed that T.I. 448A is more resistant to mosaic than Ambalema and greatly reduces the reservoir of inoculum overseasoning in the residues of roots and leaves (both upper and lower) in the soil. The virus does not move about freely in the resistant plants, nor does it enter the very young leaves of their growing tips in detectable amounts, at any rate after the ten-leaf stage is passed; in T.I. 448A from a quarter to half the plant at maturity is virus-free. Virus synthesis in inoculated resistant plants tended to be less in the upper leaves of old than in the comparable ones of young plants, and the upper leaves of old plants were inclined to be more resistant than the active young ones, indicating an acquisition of increasing resistance to mosaic in the successive leaves.

Evidence obtained from a grafting test indicated that the virus travelled no further in T.I. 448A scions on infected Wisconsin-Havana Seed stocks than it did in plants of the former inoculated directly. It would thus appear that the channels of virus flow are in some way restricted in the resistant selection. From the standpoint of gross pathology T.I. 448A falls into the class of so-called symptomless carriers, and is immune from mosaic, but the closer studies required for a solution of the basic problems of resistance and immunity must be concerned with minor as well as major signs of disease in resistant and highly susceptible genotypes. Even the slight changes induced by the virus in the oxidase, catalase, peroxidase, and protein contents of T.I. 448A represent traces of infection, and, as already suggested in an earlier note [ibid., xxi, p. 168], it seems unlikely that any of the reputedly symptomless carriers of tobacco mosaic are altogether free from the disease.

Bawden (F. C.) & Pirie (N. W.). **A preliminary description of some of the viruses causing Tobacco necrosis.**—*Brit. J. exp. Path.*, xxiii, pp. 314–328, 1942.

The authors describe the purification and properties of six cultures of viruses causing tobacco necrosis. Two of the cultures were considered to be identical. Three shared antigens but were serologically unrelated to the others, thus supporting the earlier findings [*R.A.M.*, xx, p. 383] that tobacco necrosis can be caused by different viruses.

Elrod (R. P.) & Braun (A. C.). **Pseudomonas aeruginosa : its role as a plant pathogen.**—*J. Bact.*, xliv, 6, pp. 633–644, 1 pl., 1942.

Two isolates of *Phytomonas polycolor*, the agent of a tobacco leaf spot in the Philippines, were found to be indistinguishable, on the basis of pyocyanin formation, growth at 37° C., and animal pathogenicity, from *Pseudomonas aeruginosa* [*R.A.M.*, xxi, p. 167]. Agglutination, complement fixation, and agglutinin-adsorption tests showed the two plant strains to be serologically identical with at least one animal isolate and closely related to others, while the uniformity of the group was also indicated by a limited biochemical comparison.

Fifteen isolates of *P. aeruginosa* from a variety of sources proved to be capable of attacking tobacco, on which they induced lesions identical with those described for *Phytomonas polycolor*. Many of the strains were likewise pathogenic to onion, cucumber, potato, and lettuce, the symptoms on which were exactly comparable to those caused by *Bacterium marginale* [*Pseudomonas marginalis*], thereby con-

firming the view of Mehta and Miss Berridge as to the homogeneity of the last-named organism and *P. aeruginosa* [ibid., iv, p. 252].

The adaptability of *P. aeruginosa* to both plant tissues and warm-blooded animals is considered to place it in a unique position among bacteria.

WALSH (T.) & CLARKE (E. J.). **A chlorosis of Tomatoes.**—*J. Dep. Agric. Éire*, xxxix, 2, pp. 316–325, 2 pl., 1942.

A distinct chlorosis of tomato foliage was observed in the greenhouse during 1938 and was since found to be fairly widespread in Eire. The disease, which affects all varieties alike, is characterized by a partial or complete yellowing of most leaves, except the few top ones; only the midrib and its subsidiary veins and the petiole remain green, while the margins of leaves may retain their green colour for some time longer than the rest of the leaf, but turn yellow eventually. The affected leaves are crisp and brittle, and crackle and break when rolled. Severely affected leaves very often show a bronzed hue at the end of the season. The disease impairs plant vigour in the later stages of growth, reduces the yield and the size of fruit, and delays ripening. Severely chlorotic plants are especially susceptible to attacks by parasitic fungi. The disease was found to be invariably associated with an excessively high content of potassium in the soil and the consequent 'luxury consumption' of this element, but was not influenced by the hydrogen-ion concentration. Foliar analyses both of a quantitative and semi-quantitative nature showed in every case a greater concentration of potassium in diseased than in healthy plants (in some cases one-and-a-half times as great). The results of manuring trials demonstrated that the rate of uptake of potassium was directly proportional to the amount present in the medium, while the uptake of other elements was considerably depressed by the presence of higher concentrations of potassium. It is tentatively suggested that chlorosis might arise from the insufficient uptake of some vital element induced by the presence of excessive potassium. Studies aimed at a more fundamental explanation of the cause of chlorosis are stated to be in progress.

SMALL (T.). **Stem rot on outdoor Tomatoes.**—*J. Minist. Agric.*, l, 2, pp. 64–67, 1943.

During 1942 tomato stem rot (*Didymella lycopersici*), usually rare in England, was reported from several counties [*R.A.M.*, xxi, p. 542] following the extension of open-air tomato growing. The author gives an account of the disease based on his investigations in Jersey [ibid., xix, p. 500] and suggests control measures.

MCKAY (R.). **Tomato root rot Colletotrichum atramentarium (Berk. & Br.) Taubenh.**—*J. Dep. Agric. Éire*, xxxix, 2, pp. 272–276, 6 figs., 1942.

Root rot caused by *Colletotrichum atramentarium* is stated to be one of the most prevalent and injurious diseases of greenhouse tomatoes in Eire. Complete control of the disease can be attained by removing the top 15 to 18 in. of soil from the greenhouse bed and replacing them by fresh loam brought in from the pasture, or by sterilizing the soil with either formaldehyde (2 per cent. solution, applied at the rate of 50 gals. to every 10 to 18 sq. yds. of soil, the soil then being dug over and covered with tarpaulins for 48 hours) or steam.

HIRT (R. R.). **The relation of certain meteorological factors to the infection of Eastern White Pine by the blister-rust fungus.**—*Bull. N.Y. Coll. For.*, xv, 1a, 65 pp., 2 figs., 32 graphs, 1942.

This is a fully detailed account of the writer's studies, extending over a ten-year period in northern and central New York State, on the relation of temperature, relative humidity, rain, fog, dew, and sunshine to the natural and artificial infection

of eastern white pine (*Pinus strobus*) by blister rust (*Cronartium ribicola*) [*R.A.M.*, xvi, p. 427].

Black currant (*Ribes nigrum*) was used exclusively as a source of sporidia on account of its pronounced susceptibility to the rust. Teleutospores were produced in distinct crops once or repeatedly during each season of the investigations, the phenomenon being apparently associated with leaf maturity and condition and seasonal changes. The most effective response on the part of the teleutospores to weather favouring sporidial formation, and consequently pine infection, was observed when the crops were 96 to 216 hours old. Hence severe attacks of the rust were limited to comparatively few periods when appropriate weather conditions happened to coincide with the correct phase of teleutospore development on black currants. During the period covered by the tests, most of the outbreaks occurred in the latter half of August, a few early in September, and one in July.

The teleutospores attained maturity in 24 hours. The minimum time required for pine infection under optimum moisture and temperature conditions was 11·5 hours, the maximum incidence being recorded after 19·5. Most of the infection took place at night, when free moisture was present in the form of dew, fog, or rain, and the temperature commonly fell within the optimum of 50° to 65° F. A certain amount of rust did develop even above 70°, but only if the temperature was fluctuating between the upper and lower levels, a constant temperature of 68° to 69° sufficing to inhibit infection even where other factors were propitious.

The respective order of importance of rain, fog, and dew to pine infection and sporidial production was 10 : 2 : 1 and 10 : 7 : 2, respectively. It is apparent that the regular occurrence of night fogs throughout a summer season will not only induce nearly as copious sporidial production as rain, but will also, over a protracted period, intensify infection up to the point of severe damage. The character of the 12-hour periods immediately preceding and following rainfall exerted a definite effect on the incidence of *C. ribicola*. For instance, days of sunshine and high temperature prior to a night of rain tended to delay sporidial production to such an extent that there was not enough time for pine infection, especially if another warm, sunny day ensued. Less delay in the production of inoculum followed a cloudy and relatively cool day, some infection usually resulting after an ensuing rainy night. Every summer during the experimental years the bulk of infection occurred in one or two relatively brief periods of cool, wet weather corresponding with an abundant supply of freshly produced teleutospores, so that seasonal weather conditions alone are not normally a reliable index of the amount of rust.

Some degree of silvicultural control of blister rust may be exercised by the avoidance for *P. strobus* of planting sites in climatic zones where cool, damp nights are the rule or where extended rainy periods are apt to occur during the average summer. In such places specially frequent eradication of native *Ribes* may be required, with wider protective borders to provide a maximum degree of protection from the pathogen.

Union of South Africa Department of Agriculture and Forestry. Division of Forestry Annual Report for the year ended 31st March, 1941. 18 pp., 1941.

This report (pp. 9 10, 14) contains the following items of phytopathological interest. Pines in the Jessievale (Transvaal) plantation were extensively damaged by *Diplodia pinea* following a severe hailstorm, a total of 164 acres of *Pinus patula* and 64 of *P. pinaster*, equivalent to 550,000 cu. ft. of timber, being devastated by the fungus [*R.A.M.*, xx, p. 150]. *Oidium* spp. [including *O. quercinum*] were responsible for heavy mortality among enfeebled, old, ornamental oaks at the Cape: *Quercus palustris*, *Q. suber*, *Q. serrata*, and *Q. ilex* appear to be immune from the mildew. Sporadic outbreaks of 'Albert Falls disease' [ibid., xx, p. 326] were again observed in all wattle [*Acacia mollissima* and *A. decurrens*] -growing districts,

while collar rot [? *Rhizoctonia*: loc. cit.] was also prevalent, especially at Wartburg, where it was an important factor in weakening the roots of the trees and so predisposing them to destruction by a hurricane in May.

Darley (E. F.) & Christensen (C. M.). **An unusual sporophore of Trametes suaveolens produced on artificially inoculated wood.**—*Phytopathology*, xxxiii, 4, pp. 328–330, 1 fig., 1943.

In a preliminary study at the Minnesota Agricultural Experiment Station to determine the influence of environment on the gross morphology of fruit bodies, involving a comparison of sporophores observed in nature and produced artificially, a hole 1¼ in. in diameter and 6 in. deep was bored in sections 7 in. long and 2½ in. in diameter of green ash (*Fraxinus pennsylvanica* var. *lanceolata*) and soft maple (*Acer saccharinum*), and filled to within 1 in. of the top with a mixture of wheat and oats that had been autoclaved at 15 lb. pressure for one hour on two consecutive days. The holes were loosely corked and the two pieces of wood placed vertically in a gallon jar containing about 500 c.c. water, which was autoclaved for an hour at 15 lb. pressure and left to cool prior to the inoculation of the grain mixture with a culture of *Trametes suaveolens* from maple. The considerable differences in the general form of the resultant sporophores and in the size, shape, and position of the pores, as compared with the original fruit body, are tentatively attributed to the more or less diffused light to which the cultures were exposed, a somewhat similar phenomenon having been observed in *Daedalea confragosa* under comparable conditions (*Mycologia*, xxxiv, pp. 400–402, 1942). Since small differences in environment can induce considerable changes in the growth morphology of sporophores, too much importance should not be attached to minor morphological differences between fruit bodies in nature.

Carrera (C. J. M.). **Estudio sobre la fisiologia de la Phytophthora capsici Leonian productora del 'mildiu o tizón' del Pimento en la Argentina.** [A study on the physiology of *Phytophthora capsici* Leonian, the agent of Chilli 'mildew or blight' in the Argentine.]—*Rev. Fac. Agron., B. Aires*, x, 1, pp. 156–193, 18 figs., 1942. [English and Portuguese summaries.]

A fully detailed, tabulated account is given of the author's studies on a number of physiological problems connected with chilli blight (*Phytophthora capsici*) in the Argentine [*R.A.M.*, xx, p. 224], the results of which may be summarized as follows. The fungus was shown by inoculation experiments to be pathogenic to tomato and eggplant in addition to its natural host. The organism grew best on the following liquid media (natural): 2 per cent. glucose potato broth, oatmeal broth, peptone, carrot broth, 1 per cent. glucose, and 2 per cent. peptonized broth, while the most suitable synthetic substrata were Leonian's, Mayer's, and Fermi's solutions. Rice agar was the best of the solid media tested, followed by oatmeal and 1 and 2 per cent. glucose agars. The average weight of the mycelium on a medium containing, besides dextrose and peptone (2 and 5 gm., respectively), 0·5 gm. each of potassium phosphate and magnesium sulphate and 0·2 gm. succinic acid per 1,000 c.c. distilled water, was 0·0445 gm., the corresponding figures for a substratum lacking peptone, potassium phosphate, magnesium sulphate, succinic acid, or dextrose being 0·0185, 0·028, 0·026, 0·027, and 0·0115 gm., respectively. The substitution of citric for succinic acid resulted in a yield of 0·0385 gm. from a 0·5 per cent. concentration, whilst an inhibitory effect was exerted by tartaric and citric acids at concentrations of 1 to 3 and 2 to 3 per cent. respectively. The fungus proved to be extremely sensitive to sodium arsenite and agallol. *P. capsici* was found to be capable of growth over a wide range of hydrogen-ion concentrations (P_H 3·8 to 7·8), the optimum being 6·8. The minimum, optimum, and maximum temperatures for growth were under 8° to 8·5°, 30° to 31°, and above 37° C., respectively.

Baylis (G. T. S.), Deshpande (R. S.), & Storey (I. F.). **Effect of seed treatment on emergence of Peas.**—*Ann. appl. Biol.*, xxx, 1, pp. 19–26, 3 graphs, 1943.

A full account is given of studies made from 1937 to 1941 on the control of pre-emergence damping-off of garden peas (mainly *Pythium* spp.) obtained with various seed dressings, in relation to sowing date, soil type, pea variety, and dosage of fungicide.

A test of the effect of soil temperature and soil moisture on emergence was conducted in July, 1939, in frames, seed of the Pilot (round) and Gradus (wrinkled) varieties being sown in boxes in ordinary compost. These seeds were watered either immediately on sowing or at intervals of 1, 2, and 3 days afterwards. It was found that watering immediately after sowing markedly depressed emergence, progressive improvement resulting as the date of watering was deferred. There appears to be a critical period during germination when high soil moisture is extremely deleterious. The duration of this period depends upon the germination rate, which is related to soil temperature. Further experiments confirmed the fact that high soil moisture accentuates the pre-emergence damping-off of peas.

The chief results obtained from experiments in dressing seed with fungicides were that ceresan and cuprous oxide markedly increased emergence, and that this effect was greater with cuprous oxide than ceresan but the latter has the advantage of reducing the amount of seed-borne (*Ascochyta*) disease. The addition of a sticker was deleterious to both, more so to cuprous oxide than to ceresan. It was also found, in general, that emergence of untreated peas was better at the later than at the earlier sowing date, and that this effect was most marked in the heavy soil, that the relative improvement from seed treatment was greatest in the early sowing, and that the wrinkled varieties Gradus and Lincoln gave the best response to seed treatment. The greatest improvement was with the early sowing in heavy soil. No evidence was obtained of any beneficial effect from the incorporation of a growth hormone with the seed dressing, or that such hormone reduces liability to phytocidal injury.

Agricultural research.—*Rep. imp. Coun. agric. Res., Delhi, 1941–42*, pp. 3–39, 1943.

In this report [cf. *R.A.M.*, xxi, p. 342] it is stated that race 34 of cereal black rust [*Puccinia graminis*] and a new race, H, of yellow rust [*P. glumarum*] have been discovered in India. Malling type XIII apples remained resistant to *Rosellinia* [? *necatrix*]. Peach sun scald was reduced by tying straw to the trunks of trees.

Bemisia gossypiperda induces yellow vein mosaic of bhendi [*Hibiscus esculentus*: ibid., xx, p. 242; xxi, p. 342] with greatly increased rapidity if made to fast immediately before being fed on an affected plant. Fasting for over two hours seems to increase the efficiency of the vector. The shortest period for which white-flies, after being made to fast, should feed upon a diseased leaf in order to become infective is 30 minutes. Infective individuals can transmit the virus in feeding periods of 30 minutes, and sometimes in 15. The minimum incubation period in the vector was seven hours under the experimental conditions. Infective flies retain their infectiveness until their death. The virus cannot pass from the fly to its offspring through the egg.

Nicotiana glutinosa and *Petunia hybrida* were found to be infected by the *Datura* mosaic virus [ibid., xxi, p. 342]. The virus induced local lesions in the former, but only a transitory mottling in the latter.

Fifty-fifth Annual Report of the Colorado Agricultural Experiment Station for the fiscal year 1941–42.—58 pp., 1942.

The following items of phytopathological interest, besides those already noticed from other sources, occur in this report [cf. *R.A.M.*, xx, p. 153]. Severe peach mosaic [ibid., xxii, p. 258] has been reduced from 28,934 trees in 1935 to 360 in 1941.

A minimum incubation period of 100 days was found to be necessary for the development of the disease. During the season 1,600 cross-inoculations were made by budding and grafting, the results of which demonstrated the existence of antagonism between the mild and medium strains of the virus on the one hand and the severe on the other. A distinct relationship has been observed between peach mosaic and wild morning glory areas, the latter plant being a summer and autumn host of the peach aphid [*Myzus persicae*]. Trees in such areas showed 33·1 per cent. foliar mosaic, compared with 17·2 and 3·2 per cent., respectively, in adjacent plots and isolated, respectively.

The aster leafhopper *Macrosteles divisus* (Uhl.) was found to convey yellows [ibid., xxii, 206] from aster [*Callistephus chinensis*] to lettuce and celery. A disease responsible for the destruction of celery crops in two localities in 1940 was not transmitted by *M. divisus* but by *Aphis heracella* (Davis), indicating either that the virus is a new one or that a new vector for aster yellows has been found. Plots enclosed within a cloth fence 3 ft. in height were completely protected from aster yellows, and this procedure is recommended for commercial and home gardeners during the critical months of July and August.

None of the 48 carnation varieties proved more than moderately resistant to root rot (*Fusarium dianthi*), but the introduction of chloropicrin into the soil destroyed the pathogen.

Plant pathology.—*Rep. Okla. agric. Exp. Sta., 1940–42*, pp. 63–65, 1 fig., 1942.

This report contains, *inter alia*, the following items of interest. Complete control of loose smuts of wheat and barley [*Ustilago tritici* and *U. nuda*] was obtained in two seasons' tests in 20 communities in which the Oklahoma type control equipment [*R.A.M.*, xx, p. 10] was used. Seed injury was reduced to 17 per cent., but it is believed that still greater reduction can be achieved.

Average yield increases of 19 per cent. were obtained in five years' trials with cotton seed treatment against disease [ibid., xxii, p. 205]. As a result of publicity given to this work, over 75 per cent. of the seed planted in the State in 1942 is stated to have been treated, as against 5 per cent. in 1939. The profit to farms resulting from the treatment is estimated for 1942 at more than $1,200,000.

Johnston (C. O.). **Notes on plant diseases in Kansas in 1941.**—*Trans. Kans. Acad. Sci.*, xlv, pp. 107–110, 1942.

Detailed notes are given on the prevalence of a number of plant diseases affected by the exceptional weather conditions prevailing in Kansas during the spring and summer of 1941 [*R.A.M.*, xix, p. 203].

Stapp (C.). **Der Pflanzenkrebs und sein Erreger Pseudomonas tumefaciens. X. Mitteilung. Die Virulenzsteigerung von Pseudomonas tumefaciens durch Titan.** [Crown gall and its agent *Pseudomonas tumefaciens*. Note X. The enhancement of virulence in *Pseudomonas tumefaciens* by titanium.]—*Zbl. Bakt.*, Abt. 2, civ, 23–24, pp. 395–401, 2 figs., 1942.

The addition to cultures of *Pseudomonas* [*Bacterium*] *tumefaciens* on a synthetic medium of 0·0001 to 0·001 per cent. titanium sulphate resulted in a marked access of pathogenicity, judged by the size of the tumours induced on *Datura tatula* by the dahlia isolate (Ra) of the organism [*R.A.M.*, xxi, p. 444].

Melhus (I. E.), Shepherd (D. R.), & Corkle (Marie A.). **Diseases of cereals and Flax in Iowa.**—*Proc. Iowa Acad. Sci.*, xlix, pp. 217–247, 1942.

This paper is described as 'an attempt to summarize available records of the prevalence and destructiveness of the diseases of cereals and flax in Iowa and to interpret the early general reports on the basis of our present knowledge of plant

pathology'. Among the points of special interest the following may be mentioned. Applying the hypothesis of N. E. Stevens, that Stewart's disease of maize (*Bacterium* [*Xanthomonas*] *stewarti*) will usually be absent following a winter with a temperature index below 90 and present in destructive amounts after one with an index above 100 [*R.A.M.*, xx, p. 528], to the seasons of 1931 and 1933, when the pathogen caused considerable losses in the State, the relevant indices were found to be 91 and 77, respectively. Several very desirable resistant strains have recently been developed and one of these, Ioana, has been distributed by the Agricultural Experiment Station.

The heaviest losses from crown rust of oats (*Puccinia coronata*) recorded in Iowa of recent years were 24 and 30 per cent. in 1938 and 1941, respectively. In such years the spores are believed to be blown into the State *en masse* from infection centres in the south. Plentiful moisture and moderate temperatures in May favour the development of the aecidial stage of the rust on *Rhamnus* spp., while similar conditions in June promote its rapid spread on oats. The epidemics of oats smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]) of 1928, 1932, and 1941 were the heaviest of recent years, each involving a loss of 7 per cent. Low soil moisture in April tends to increase the liability of the host to infection. Root necrosis caused by *Pythium de Baryanum* has been engaging the attention of Iowa phytopathologists of late years. The losses from this disease reported for 1938, 1939, 1940, and 1941 were 12, 6, 12, and 7 per cent., respectively.

Stem rust of wheat (*Puccinia graminis*) has been conclusively proved to migrate from the southern States into Iowa, where serious losses from this source occur only in years when the wind-blown inoculum is plentiful, southerly winds prevail for several days during the growing season, local crops are later than usual, and environmental conditions favour the establishment and spread of the pathogen. The almost complete elimination of spring wheat from the Iowa cropping scheme is attributed largely to stem rust.

In 1935, 1936, and 1937 seed treatment of Redwing and Bison flax increased field stands by 68, 20·7, and 9·6 per cent., respectively, probably in large part by controlling the soil-borne organisms, *Pythium de Baryanum* and *Rhizoctonia* [*Corticium*] *solani*.

WARNER (J. D.). **New Oat varieties for the southeast. Florida's Quincy Nos. 1 and 2, highly resistant to rust and smut, also show promise in Georgia and Alabama.**—*Sth. Seedsm.*, v, 12, pp. 9, 29, 1942.

Quincy Nos. 1 and 2, two varieties of oats distributed in 1940, are both resistant to rust [*Puccinia coronata*], the former being immune from, and the latter highly resistant to, smut [*Ustilago avenae* and *U. kolleri*]. No. 1 (Victoria × Kanota) is a red variety and No. 2 (Red Rustproof × a hybrid between Victoria and Norton) white.

ELLETT (C. W.). **Leaf blight of Corn.**—*Phytopathology*, xxxiii, 5, pp. 407–408, 1943.

Two types of dent corn [maize] leaf blight have been experimentally shown to occur in Ohio, where losses from this source during the past four years are estimated to exceed those from any other disease, viz., bacterial (*Phytomonas* [*Xanthomonas*] *stewarti*) and fungal (*Helminthosporium turcicum*), the former causing serious losses in but few instances and the latter being the more prevalent and also affecting Sudan grass and *Sorghum halepense*. The symptoms of the two disorders are usually distinguishable without difficulty in the field. The bacterial lesions are irregular spots or streaks, often extending almost the entire length of the leaf, while those of the fungus are roughly elliptical, up to 14 by 1 to 4 cm., sometimes zonate, with a brown to reddish margin and a greenish-black growth of conidiophores and conidia often covering the centre. In both cases coalescence of the

lesions is frequent and the leaf soon dies and shrivels. Preliminary greenhouse tests of the reaction to *H. turcicum* of 24 inbred lines, 26 single, and 6 double crosses yielded no evidence of seedling resistance, but in the field there were marked differences in the amount of infection, among the more resistant inbred lines being KYS, Ia. L317, Ia. L289, Ohio 02, and Ohio 40B, and Hybrids Ia. 939, U.S. 13, and Ohio L86.

Semeniuk (G.). **Charcoal-rot of Maize, new to Iowa.**—Abs. in *Proc. Iowa Acad. Sci.*, xlix, p. 256, 1942.

Charcoal rot of maize (*Sclerotium bataticola*) [? *Macrophomina phaseoli*] was observed, for the first time in Iowa in mid-August, 1941, on several prematurely dead stalks in an early-planted field. Greenhouse inoculation tests with the pathogen resulted in seedling infection with necrosis of the roots and mesocotyl.

Timm (E.) & Lindstrom (E. W.). **Experimental proof of mutation in virulence of the bacterial wilt pathogen of Maize.**—Abs. in *Genetics*, xxviii, 1, p. 94, 1943.

Beginning with a single cell of *Phytomonas* [*Xanthomonas*] *stewarti* of medium-plus virulence, 55 mutants were isolated and stabilized at the Iowa State College [*R.A.M.*, xxi, p. 523], and tested, together with six parental strains and three controls, for pathogenicity in a triple-lattice greenhouse experiment by means of individual plant inoculation of a highly susceptible line of sweet corn. The 55 mutants were found to exhibit highly significant differences in degree of virulence as measured by lesion and plant-weight indices, most of them emerging with a lower level of pathogenicity than that of the parents: three, however, were more virulent than their progenitors, two significantly so. The variants further differed in colony morphology, for which they bred as true as did the parent strain.

Kung-Hsiang (L.). **Convex gum, a new disease of Citrus in China.**—*Phytopathology*, xxxiii, 5, pp. 394–396, 1 fig., 1943.

Orange trees, mostly young, in Fukien Province, China, were observed in 1941 to be suffering from a disease, believed to be caused by a seed-transmissible virus related to psorosis and characterized by two types of cortical swelling and gummosis of the trunk, limbs, and twigs. In the commoner and more serious form, the bark swellings are large (average 2·5 cm. in diameter on the trunk), smooth, and more or less round, and an abundance of brownish gum, of a semi-liquid to cheesy consistency, is produced in large, flattened pockets in the wood, 1 to 5 mm. below the cambial layer, and may rupture the cortex, on which canker-like, coalescent lesions are formed, later girdling and killing the twigs. The affected trees are liable to be killed or severely stunted. On the other hand, little damage is caused by the relatively small swellings (1 cm. in diameter) and dark brown, gum-filled spots of the less prevalent second type. The average incidence of the disease in several Foochow orchards was 64 per cent.

For the control of convex gum the author proposes a system of certification based on the Californian treatment of psorosis [*R.A.M.*, xviii, p. 248; xix, p. 86].

One 30-year-old tree (only two of this age were found to be diseased) recovered after the excision of the infected tissue and the application to the soil of liberal quantities of fertilizer.

Robá (R. P.). **El 'ojo de gallo'; enfermedad del Cafeto.** [The 'cock's eye' disease of Coffee.]—*Bol. Minist. Agric. Nicaragua* 7, 15 pp., 5 figs., 1940. [Abs. in *Exp. Sta. Rec.*, lxxxviii, 6, p. 778, 1943.]

Coffee leaf and berry spot (*Omphalia flavida*), stated to be one of the most injurious diseases of the crop in Nicaragua, is described in relation to its geographical distribution, propagation, factors promoting its development, and control.

Harrison (G. J.). **Breeding California Cotton.**—*Calif. Cultiv.*, lxviii, p. 696, 1941. [Abs. in *Plant Breed. Abstr.*, xiii, 3, p. 241, 1943.]

Tests of the reaction of the cotton varieties grown in California to *Verticillium* wilt [*V. albo-atrum*: *R.A.M.*, xix, p. 14; xx, p. 393] have been made both in the laboratory and the field, with comparable results in the two series. Resistance to the disease has been shown to be generally associated with late maturity, small bolls, and short staple, but certain American-Egyptian varieties were also found to be capable of withstanding infection. Direct selection, hybridization, and backcrossing are being successfully used in breeding for wilt resistance.

Presley (J. T.) & King (C. J.). **A description of the fungus causing Cotton rust, and a preliminary survey of its hosts.**—*Phytopathology*, xxxiii, 5, pp. 382–389, 2 figs., 1943.

The causal organism of cotton rust in Arizona and Texas, previously tentatively referred to *Puccinia boutelouae* [*R.A.M.*, xxi, p. 253], has been found by G. B. Cummins to differ from that and all species heretofore described on *Bouteloua* in the presence in its uredospores of three equatorial pores instead of several scattered ones, and it is accordingly designated *P. stakmanii* n. sp.

The fungus is characterized by amphigenous and caulicolous, punctiform, honey-yellow to cadmium-orange, later brownish, depressed, globose pycnidia, 90 to 120 μ in diameter, occurring in small, slightly raised, circular groups, with ostiolar filaments 60 to 100 μ long; cylindrical aecidia, 0·4 to 1 by 0·2 to 0·3 mm., surrounding the pycnidia in irregular groups; an orange, later yellowish or hyaline peridium, with a lacerate, recurved margin and quadratic or oblong cells, 17 to 30 by 11 to 20 μ, with a striate outer wall, 6 to 9 μ in thickness, and a strongly echinulate inner wall, 2·5 to 4 μ; globoid or broadly oblong aecidiospores, 18 to 25 by 13 to 19 μ, with very pale yellow to hyaline, finely verrucose walls, 2 to 5 μ thick; mostly epiphyllous, interveinal, oblong or linear, confluent, pale cinnamon-brown, pulverulent uredosori, 0·3 to several mm. in length; globoid to broadly ellipsoid uredospores, 25 to 27 by 18 to 22 μ, with a pale cinnamon-brown, moderately echinulate wall, 1·5 to 2·5 μ in thickness, with pores as mentioned above; amphigenous and caulicolous, rounded, elliptical or linear, confluent teleutosori, 0·3 to several mm. in length; and oblong or broadly ellipsoid teleutospores, 26 to 38 by 19 to 25 μ, with dark chestnut-brown walls, 4 to 9 μ thick at the apex, furnished with one septum, sometimes oblique or vertical, and a hyaline pedicel, two or three times the length of the spore. The pycnidial and aecidial stages are found in nature on the leaves and stems of *Gossypium barbadense* and *G. hirsutum*, and the uredo- and teleutosori on *B. rockrothii*. In greenhouse inoculation experiments all the cultivated cotton varieties represented in *G. barbadense*, *G. hirsutum*, and *G. hopi* were classed as susceptible; *G. arboreum* was mildly susceptible, eight out of ten wild cotton species were mildly susceptible and one susceptible; and five other Malvaceae resistant. Four out of five species of *Bouteloua* tested were susceptible and one mildly so, while eight species of *Muhlenbergia* and nine of *Sporobolus* were resistant.

In normal seasons the moderate amount of defoliation caused by *P. stakmanii* does not seriously impair the health of the plants, but the severe attacks coinciding with frequent rains and high relative humidity in the late summer or early autumn, such as occurred in Hidden Valley, Arizona, in 1940, may result in the shedding of most of the leaves and many of the bolls. Fields have been observed in which the incidence of infection reached 100 per cent. and more than half the effective leaf surface of the plants was destroyed or damaged. The alternate grass hosts of the rust in or on the borders of irrigated cotton plantations commonly grow much larger and produce more inoculum than the desert-grown specimens

dependent on rainfall; hence some degree of control may be achieved by clean cultural practices both within and along the borders of the fields.

CHESTER (K. S.) & RAY (W. W.). **How to get better Cotton yields in 1943 by seed treatment.**—*Circ. Okla. agric. Exp. Sta.* C-109, 8 pp., 3 figs., 1943.

In 1942 much of the cotton seed sown in Oklahoma was imported from other States and had been treated, with the result that the crop for that season was good, whereas the seed to be sown in 1943 is home-grown and must be treated. Five years' tests showed that seed disinfection (at a cost of only a few cents per acre) gave an average increase in yield of 19 per cent. Seed treatment is important because it prevents or delays infection by the most prevalent and serious cotton disease in Oklahoma, angular leaf spot [*Xanthomonas malvacearum*: *R.A.M.*, xxi, p. 414].

The most useful treatment under local conditions is that with new improved ceresan, but as this chemical is likely to be in short supply, 2 per cent. ceresan is recommended, though (if the seed is to be sown in neutral to alkaline soils) spergon may be used instead. Instead of the 1½ oz. of new improved ceresan per bush. of fuzzy seed usually applied, the amount may be reduced to 1 oz. or even to ½ oz. if the dust is well mixed with the seed. The dosage of 2 per cent. ceresan can be reduced from 3 to 2 or 1½ oz. per bush. if applied to re-ginned seed. With spergon the dosage may be 3 oz. per bush. of fuzzy seed, or 2 oz. per bush. of re-ginned seed. The seed should be stored in a fairly air-tight container for 24 to 48 hours after being treated. When treated cotton is used, the sowing rate may be reduced by one-third without impairing the stand. Thus, the cost of seed and chopping can be lowered, and seed conserved for war uses. In general, ½ bush. of treated seed gives as good a stand as ¾ bush. of untreated, if sown at a moderately even rate. Seed may be treated from one day to a year before sowing. Directions are given for making a metal drum seed treater and one of the box type.

DRECHSLER (C.). **A new nematode-capturing Dactylella and several related Hyphomycetes.**—*Mycologia*, xxxv, 3, pp. 339–362, 4 figs., 1943.

The author describes a further new predaceous fungus parasitic on nematodes [*R.A.M.*, xxii, p. 136] under the name of *Dactylella heterospora*, found in Virginia. Descriptions are also given of three new species, *D. heptameres*, *D. rhopalota*, and *D. atractoides*, all found in Maryland, which belong to the same group, but have not yet been proved to be either predators or parasites.

DRECHSLER (C.). **Two new Basidiomycetous fungi parasitic on nematodes.**—*J. Wash. Acad. Sci.*, xxxiii, 6, pp. 183–189, 2 figs., 1943.

Technical diagnoses are given of two additional fungous parasites of nematodes, viz., *Nematoctonus* [*R.A.M.*, xxi, p. 15] *pachysporus* n. sp., destroying a member of the *Rhabditis* group in decaying tomato roots near Beltsville, Maryland, and *N. leptosporus* n. sp., attacking a species of *Bunonema* [cf. ibid., xxii, p. 136] in leaf mould in the Fairfax district of Virginia.

MCCLELLAN (W. D.). **Control of powdery mildew of Roses in the greenhouse.**—*Bull. Cornell agric. Exp. Sta.* 785, 39 pp., 2 figs., 2 graphs, 1942.

A full account is given of an investigation carried out under laboratory and commercial greenhouse conditions in New York into the control of rose powdery mildew (*Sphaerotheca pannosa* var. *rosae*) [*R.A.M.*, xviii, p. 681]. The toxicity of 50 different fungicides to the conidia of the fungus on excised rose leaves was determined by spore germination tests, and the superiority of sulphur over copper fungicides clearly demonstrated. For the more critical comparison of fungicides, spore germination tests were carried out on parts of the same leaflet after treat-

ment with a known amount of a given fungicide applied by means of a spray tower. Conidia were dusted over all portions simultaneously and the results analysed statistically. The toxic action of ten different materials, including a particulate sulphur, soluble and insoluble coppers, and silver on the conidia on rose leaves was investigated. When the conidia were not wet with the fungicide, only sulphur reduced germination appreciably, while when they were wet for a short time, the soluble coppers as well as sulphur markedly reduced germination.

In tests in commercial greenhouses sulphur dust was ineffective for control purposes. Good control was, however, achieved with five wettable sulphurs, including walcolized sulphur (Walco Products, N.Y.), mike, fungisal, and protex colloidal sulphur (Protex Industries, N.Y.), and one copper material when used in a protective spray programme in combination with IN 438 (64 per cent. sodium oleyl sulphate: Du Pont) at a concentration of 1 in 1,000 as a wetting agent. The latter when used alone was more effective than sulphur dust, which was, moreover, the only material that caused foliar discoloration. The disease can be easily controlled by protective spraying, but once the infection becomes severe control is difficult. In tests of 21 miscellaneous materials as eradicant sprays, malachite green gave the best control, but caused some blossom discoloration. Excellent control, but severe foliar injury, resulted from spraying with four different soluble sulphurs. Good control without any burning was given by the particulate sulphurs. Excellent control followed the use of R.S. 380, a thiocyanate-containing insecticide (Röhm and Haas Co., Philadelphia) in an eradicant spray.

The relative effectiveness of wetting agents as spray supplements in mildew control was next studied. Evidence obtained demonstrated that surface tension and contact-angle measurements, used as criteria of wetting ability, do not invariably rate wetting agents in the same order. Leaf age, surface, and variety all affected contact-angle measurements. In all varieties the lower surface was, as a rule, the more difficult to wet. When rose leaves unfold they are not particularly difficult to wet, but become increasingly so up to the sixth day, after which wetting becomes gradually easier.

Conspicuous differences in toxicity, as measured by spore germination tests, were observed when 15 spray supplements were compared. Of those under test, IN 181 (72 per cent. sodium lauryl sulphate: Du Pont) was the most toxic. When the same supplements were compared in combination with the same particulate sulphur in each test in an eradicant-spray programme under commercial greenhouse conditions, marked differences in control resulted. Good control followed when vatsol [ibid., xix, p. 374] OT (sodium alkyl ester of sulphosuccinate: American Cyanamid and Chemical Corp.), IN 438, IN 181, and Grasselli spreader-sticker were used as the spray supplements. These differences were attributed to variations in wetting and in the toxicity of the supplements, and were not noted when the materials were used in a protective spray programme.

In preliminary tests only 6·8 per cent. of the lesions remained active after a three-day exposure to sulphur vaporized at 112° to 115° C., while 77·4 per cent. were active after similar exposure to sulphur vaporized at 85°.

The effect of syringing on the mildew was determined in a badly infected commercial greenhouse. Replicator plots syringed once, twice, three, and six times a week for four weeks showed 430·5, 312·75, 292·25, and 112·5 mildew lesions per plot, respectively. As, however, the treatment provides ideal conditions for the dissemination of *Diplocarpon rosae* and increases labour it is not recommended in practice.

BICKERTON (J. M.). **Fusarium wilt of Carnations caused by Fusarium dianthi Prill. et Del.** – *Bull. Cornell agric. Exp. Sta.* 788, 31 pp., 6 figs., 2 graphs, 1942.

Fusarium wilt of carnations, caused by *F. dianthi* [*R.A.M.*, xv, p. 225], was

observed for the first time in 1898 in Connecticut, and has subsequently been reported from France, South Africa, Uganda, Denmark, Italy, Czechoslovakia, England, Belgium, Germany, New Zealand, [and the Argentine: ibid., xx, p. 235]. In the United States a wilt caused by *F. dianthi* or *F.* sp. has been recorded from 15 widely scattered states, and has been identified by the author on material from Illinois.

Under the conditions on Long Island, where a study of the disease was carried out by the author from 1933 to 1940, losses caused by *Fusarium* wilt are stated to be second only to those due to *Alternaria* blight [*A. dianthi*: ibid., xvi, p. 659]. The disease generally kills the affected plants, and may cause a complete loss of certain varieties in the greenhouse as well as in the field. Losses from the disease in the field or in the greenhouse prior to the final benching are slight in comparison with subsequent losses. In the permanent location in the greenhouse most infections occur in autumn or spring, decreasing slightly during the winter. Field observations and inoculation experiments showed that among commercial varieties, My Love and Spectrum Supreme are extremely susceptible, while Puritan, Patrician, Peter Fisher, and Maine Sunshine appeared to be highly resistant. The symptoms of the disease are typically unilateral and comprise yellowing, wilting, stunting, and necrosis. They spread upwards following the gradual upward extension of the pathogen and the discoloration of the vascular tissue of roots and stem, until finally an entire plant is affected and eventually killed. The disease can be recognized by the clusters of sporodochia and pionnotes, the minute sclerotial bodies, and the white mycelium on the surface of diseased tissue. The main source of infection is infested soil, in which the pathogen was shown to survive for two winters, but infected cuttings and plants are also important.

Infection occurs principally through the roots but also through wounds in the base of the main stem. Inoculations at 70° to 80° F. resulted in 92 per cent. infection, at 60° to 70° in 66 per cent., and at 50° to 65° in 39 per cent. The latent period of infection for stem wound infections ranged from 12 to 28 days at 70° to 80° and up to 41 days at 50° to 65°, and that for root infections from 23 to 45 and 56 to 75 days, respectively. High temperatures, however, not only increased infection and shortened the incubation period but increased the rate of mortality.

In control experiments disinfection of bench soil in the greenhouse with concentrated commercial formalin (1 gal. per 50 sq. ft.), and particularly chloropicrin (by injection at the rate of 2, 2½, and 3 c.c. per sq. ft.) resulted in a marked reduction in infection and a consequent increase in flower production of susceptible varieties; in the field both materials were on the whole ineffective, and therefore healthy cuttings and resistant varieties should be used. Susceptible varieties should be grown in new or well-rotated soil in the field (the required length of rotation is not known) as well as in the greenhouse; when old soil is used in greenhouse benches, it should be disinfected with chloropicrin or formalin.

PAPE (H.). **Untersuchungen über das Schwarzwerden der Maiblumenkeime.** [Studies on the 'blackening' of Lily of the Valley rhizomes.]—*Angew. Bot.*, xxv, 1–2, pp. 29–54, 14 figs., 1943.

Lilies of the valley are extensively grown on a commercial scale in Germany, about ⅓ of the crop being exported at a yearly pre-war value of well over RM. 1,000,000. The destructive 'blackening' disease has long been recognized as serious, but hitherto its etiology has remained obscure. The present contribution deals with the writer's studies, at the newly established flower disease bureau of the Biological Institute, on the cause of the trouble, the control and prevention of which are to be discussed in a forthcoming paper.

The symptoms are most conspicuous in the late autumn and winter in the warehouse and during storage in the boxes prepared for export. The buds are

partially or entirely blackened and the tissues rotted, tending to break off at a touch on the base and revealing a discoloured area with a lighter centre. Infection begins as a small, ill-defined, grey spot, gradually spreading in all directions, though often confined in the early stages to one side of the bud. The primary bud is frequently the only one involved; in other cases this is healthy and the secondary buds are diseased, while yet again all the buds on a rhizome may be attacked. The axes are also liable to infection, showing deep black areas over which the cortical tissue is scabbed and roughened, the rot often extending inwards to the woody central cylinder. The roots are similarly affected. Infection spreads with great rapidity from one rhizome in a bunch to the others, a period of 8 to 14 days sufficing for the contamination of an entire lot.

The percentage of forced marketable flowers produced by the blackened rhizomes ranges from 0 to 50 per cent. according to the intensity of infection. In one-year-old stands in the open, gaps of up to 1·5 m. in length point to the presence of the disease, while in those of two to three years old the occurrence of empty spaces is sporadic, denoting the extension of the pathogen from its original focus to the neighbouring rows.

The fungus isolated from the diseased rhizomes is named *Sclerotium denigrans* n.sp. It grew well on 2 per cent. malt agar and soaked wheat and barley seed-grain (2 : 1), the minimum, optimum, and maximum temperatures for its development being below 2°, 21°, and 32° C., respectively. The organism proved to be highly resistant to cold, withstanding two months' exposure to day temperatures as low as —18°, and also remained viable after eight months' desiccation. *S. denigrans* is characterized by a pale grey mycelium, darkening to fuscous-fuliginous or olive-brown, septate, branched, 2·5 to 9·5 (average 5 to 7) μ in diameter, and two forms of sclerotia, one depressed-spheroid or -ellipsoid, woolly to rugose, dirty grey or black, without a sharply-defined cortex, consisting of loose strands of dark grey hyphae and measuring 0·6 to 1·3 mm. in diameter, and the other subglobose, with a dull black, well-marked cortex and a white, pithy interior, composed of densely interwoven, hyaline, branched hyphae, and measuring 0·3 to 1 mm. in diameter. *S. denigrans* is believed, from a study of the relevant literature, also to attack lilies of the valley in Sweden and Holland. Inoculation experiments gave positive results on wounded and unwounded lilies of the valley, but none of the other 16 plants tested were susceptible.

The writer did not observe that the nature of the soil exerted any particular influence on the course of the disease, but others have reported that the fungus thrives in moorland and old garden soils with a plentiful admixture of humus, and may be checked by rotation with root crops to facilitate thorough aeration. Immediately after harvesting or on delivery the rhizomes should be packed in clean, white sand rather than in soil, while another possibility of combating the disease lies in packing them in moss-lined boxes and storing at —4° to —8°. Autumn planting, in preference to overwintering for setting out in the spring, is also recommended. Considering the ease with which the blackening fungus may be inadvertently introduced into a healthy nursery in an uninfested region on externally sound rhizomes, the sale of material from localities harbouring the pathogen should be prohibited pending the discovery of some commercially practicable method of control.

Dimock (A. W.) & Osborn (J. H.). **An Alternaria disease of Zinnia.**—*Phytopathology*, xxxiii, 5, pp. 372–381, 3 figs., 1943.

A destructive disease of garden zinnias (*Zinnia elegans*), which has been under observation at Cornell University since 1934, is attributed to *Alternaria zinniae* Pape [*R.A.M.*, xxi, p. 492], with which the pathogens reported from England by Beaumont [ibid., xviii, p. 654] and Denmark by Anna Weber and Neergaard [ibid.,

xvii, p. 96] are believed to be identical. The reddish-brown spots on the leaves, sometimes with greyish-white centres on the upper side, range from 2 to 10 (average 5) mm. in diameter. On the petal tissues of the ray flowers the brown spots measure 1 to 2 mm. in diameter and in some cases are also greyish-white in the centre. The affected petals turn dark and wither, thus becoming useless for cutting or as garden specimens. The internodal areas of the stems bear numerous reddish spots, sometimes greyish-white in the centre and rarely more than 1 mm. in width, though often longitudinally elongated; at the nodes, large, deep-seated lesions develop and frequently kill the distal portion of the stem by girdling, which also follows the development of dark brown to black, centrally depressed basal cankers. The cortical tissues of diseased roots turn dark grey, rot completely, and slough off, causing the wilting and death of the plants.

The conidia of *A. zinniae* average 170 to 210 by 20 to 24 μ, inclusive of the beak, which is commonly twice as long as the spore body. Catenulation was not observed in nature, but chains of up to eight spores occasionally developed on material kept for a few days in a dry chamber. At the optimum temperature of 27° C., the fungus grows rapidly on potato dextrose agar exuding a reddish pigment, dependent on the presence of sugars in the medium, as the culture ages. Sporulation was very scanty on all the substrata tested. In inoculation experiments the optimum temperature for leaf infection lay between 65° and 75° F., probably near 70°. The lower leaf surface was more easily invaded than the upper. The fungus was also shown to be capable of entering the stems and roots of its host.

A. zinniae is apparently able to withstand at least one winter in or on the soil, and the available evidence strongly suggests that it is seed-borne. General recommendations for control of the disease, based on its probable pathogenesis, include thorough field and garden sanitation, lengthy crop rotation, the sterilization of implements before use in new plantings, and the fungicidal treatment of seed and seedlings.

Chamberlain (E. E.) & Matthews (R. E. F.). **A virus disease of cultivated Daphne.**—*N.Z. J. Sci. Tech.*, A, xxiii, 4, pp. 254–256, 3 figs., 1941 (issued 1942).

Daphne odora plants sent to Australia from Levin, New Zealand, in 1938, were rejected by inspectors at the port of entry on account of foliar mottling and returned to their place of origin where they have since been shown to harbour an unidentified transmissible virus which also occurs at Pukekohe, Auckland, and Palmerston North. The pale yellowish mottling may assume the form of an even mosaic or develop in large, irregular patches, tending to follow the veins and sometimes accompanied by distortion of the lamina. The growth of the plants is not affected by the disorder. The virus was readily transmitted by inarch-grafting but only with difficulty by means of leaf-rubbing with the juice of mosaic plants, while it was absent from most of the symptomless shoots on infected plants. Control consists in the striking of cuttings only from healthy plants.

Sullivan (J. T.) & Chilton (S. J. P.). **The composition of White Clover leaves as affected by rust and by sulphur.**—*Phytopathology*, xxxiii, 5, pp. 401–402, 1943.

The analytical data from studies on the influence of leaf rust (*Uromyces trifolii*) [*U. trifolii-repentis*] and the sulphur dust used for its control on the composition of white clover (*Trifolium repens*) foliage [*R.A.M.*, xx, p. 535] indicated that rusted plants were higher in protein and fat and lower in water and nitrogen-free extract than were sulphured plants. Sulphur-treated rust-resistant plants showed increased ash and fibre and decreased protein contents compared with the untreated. Data secured from rusted and non-rusted leaves from the same plant showed that the former were higher in ash, fat, fibre, and nitrogen-free

extract and lower in moisture and protein than the latter. It is evident that sulphur-treated plants are not suitable for use as controls to determine the effects of the rust on chemical composition.

Baten (W. D.) & Marshall (R. E.). **Some methods for approximate prediction of surface area of fruits.**—*J. agric. Res.*, lxvi, 10, pp. 357–373, 3 figs., 8 graphs, 1943.

In investigations on spray coverage and other problems it is sometimes desirable to know the surface areas of the experimental apples used, and in this paper the authors describe mathematical equations they have developed to facilitate the approximate prediction of exposed surfaces or surface areas of different varieties of apples, pears, and plums.

Jahn (E.). **Untersuchungen zur Vorherbestimmung des ersten Spritztermines beim Apfelschorf.** [Studies on the pre-determination of the first spraying date for Apple scab.]—*Angew. Bot.*, xxv, 1–2, pp. 55–78, 3 graphs, 1943.

A tabulated account is given of the writer's experiments at the Biological Institute, Dahlem, Berlin, to test the practicability of Holz's methods for the prognostication of the date of inception of ascospore discharge in apple scab (*Venturia inaequalis*), on which the spraying schedule for a given season is based [*R.A.M.*, xviii, p. 531]. Under outdoor conditions the process was observed to commence a few days after the initial discharge of the spores on overwintered leaves tested in the laboratory; allowance being made for the slight delay, the appropriate dates for spraying could be reliably predicted on this basis.

Perithecia-bearing leaves on vaseline-coated slides require only momentary moistening to induce ascospore discharge, which generally reaches a climax within half an hour and is completed within two hours both at room temperature and at 2° C., except in the case of very desiccated material, when up to three hours may be necessary. It is advisable to bring the leaves into the laboratory the evening before the experiments are to be made, placing them on slightly damp filter paper in moist chambers. The most suitable distance between the slide and the leaf for spore fall is 3 mm. and five diagonal rows of an area of 18 by 18 mm. suffice for the count.

During the three-year period from 1940 to 1942 the aggregate temperature for March was 140° compared with 105° computed by Holz for Stade [Schleswig-Holstein: loc. cit.]. With this difference the perithecia developed according to rule provided that they contained at any rate young asci, but further investigations are needed to determine the conditions for arrival at this stage.

Rasmussen (E. J.). **Effect of spray materials on finish and keeping quality of Apples.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxv, 3, pp. 263–271, 3 figs., 1943.

This is a tabulated discussion of the results obtained in experiments carried out in 1937, 1940, 1941, and 1942 to determine the effect of various anti-scab [*Venturia inaequalis*] spraying materials on the finish and keeping quality of apples under Michigan conditions. Bordeaux and proprietary copper-containing preparations were found to produce fruit with a poor finish compared with that of trees treated with lime-sulphur or wettable sulphur when applied in an all-season schedule. Of the varieties tested, McIntosh and Jonathan were the most susceptible to injury from copper, which should not be used at all on the former or for early applications on the latter. Although Delicious and Northern Spy are comparatively resistant to russeting, the exclusive use of copper fungicides is not recommended; if applied in the later treatments, they should be mixed with at least an equal amount of lime. Russeted fruit loses weight faster and shrivels sooner in storage than smooth-finished: on a 1,000-box basis (50 lb. apples per box)

the 12 per cent. loss in Northern Spy of the 1941 crop by 12th March, 1942, would have amounted to 2,185 lb.

PALMITER (D. H.) & HILDEBRAND (E. M.). **The yellow-red virosis of Peach : its identification and control.**—*Bull. N.Y. St. agric. Exp. Sta.* 704, 17 pp., 1 col. pl., 1 fig., 1 diag., 1943.

In this semi-popular bulletin on 'X' disease or yellow-red virosis of peach [*R.A.M.*, xxii, p. 256], the authors state that the disease is becoming widespread throughout the north-eastern and north-central states on both peaches and chokecherries (*Prunus virginiana*). On peach the condition can be recognized by the striking contrast between the affected and healthy branches at midsummer, when the leaves on the affected parts drop off after turning yellow and displaying purplish-red areas which become brittle and fall out. The diseased branches bear no good fruits, but some of the small fruits become mummified and remain on the tree for the whole season. The most conspicuous symptom on chokecherry is the bright yellow to red colour of the leaves from mid-June until frost sets in. Affected plants weaken progressively, tend to form rosettes on the terminal growth, and finally succumb. If diseased chokecherries are allowed to remain in the vicinity, spread through a peach orchard may be very rapid, many orchards being ruined in three or four years. Where chokecherries cannot be controlled by cultivation they should be chemically eradicated [loc. cit.]. No peach variety has been found to be resistant when inoculated with diseased buds, and nectarines, almonds, Bessey cherry, and Hortulana plum have all been successfully inoculated. *P. serotina*, which often grows in association with *P. virginiana*, does not carry the disease. The symptoms on both peach and chokecherry are well illustrated by a coloured plate facing p. 10.

HAHN (G. G.). **Blister rust on Red Currant.**—*Phytopathology*, xxxiii, 5, pp. 341–353, 1943.

For the sake of convenience all cultivated red currants tested for their reactions to blister rust (*Cronartium ribicola*) have hitherto been classed with *Ribes sativum*, the most susceptible member of the group, but in the light of present knowledge of the taxonomic-pathological relationships of certain varieties this conception must be revised and Thayer's classification (*Bull. Ohio agric. Exp. Sta.* 371, 1923) followed. Under this scheme the origin of the cultivated red currant is traced to at least three European species, *R. petraeum*, *R. rubrum*, and *R. sativum* with its var. *macrocarpum*. Varieties comprised within the first-named group are reputed to be highly resistant to, or immune from, blister rust [*R.A.M.*, xix, p. 158]; they include Rivers Late Red, Long Bunch Holland (syn. Holland, Franco-German), Red Dutch, and Viking (immune), and Prince Albert (highly resistant).

The writer's greenhouse inoculation tests on Red Dutch confirmed von Tubeuf's field observations and trials in Germany demonstrating the immunity of this variety [ibid., xiv, p. 666]. The morphological characters of Red Dutch and Viking are very similar and distinguishable during the growing season from those of the common susceptible garden varieties belonging to *R. sativum*. Selections, possibly homozygous for resistance, of rust-immune Vikings, some producing red and others white fruit, are now reported. During the period from 1937 to 1940 there was very little production of teleutosori on the few susceptible individuals among a large population of F_2 Viking seedlings.

London Market, a commercial variety of the small *R. rubrum* group, has been extensively investigated, and forms of it are reported to be semi-immune. This currant was grown from 1935 to 1940 at the Central Experimental Farm, Ottawa, and developed only slight infection in spite of more or less severe attacks on adjacent black currants during the same period. Most of the varieties that have

been tested for resistance belong to the *R. sativum* and its var. *macrocarpum* groups, which include some of the forms now recognized as most susceptible, although in the early 1920's they were widely recommended for cultivation in the United States. The natural early defoliation characteristic of *R. sativum* and its hybrids is probably augmented by the necrosis due to infection by *C. ribicola*.

MEREDITH (C. H.). **The effect of soil and chemical mixtures on the growth of Fusarium oxysporum cubense.**—*Phytopathology*, xxxiii, 5, pp. 398–400, 1943.

Mercury compounds were the most effective of the various chemicals tested for the elimination of *Fusarium oxysporum cubense* in air-dried clay soil at the Glenleigh Laboratory, Friends' College, Highgate, Jamaica [*R.A.M.*, xxi, p. 340], 11 out of 12 being capable of inhibiting the growth of the pathogen at concentrations of less than 1 in 10,000, viz., mercuric ammonium chloride, mercuric carbonate, mercuric chloride, mercuric iodide, mercuric oxide (red and yellow), mercuric sulphate, mercurous chloride, and three mercury dusts. Another nine compounds were more or less effective at 1 in 100 or less, namely, acetic acid, borax, boric acid, cadmium sulphate, iodine, Paris green, phenolphthalein, potassium dichromate, silver nitrate, and thymol, while 55 were of no value for the object in view.

MEREDITH (C. H.). **The antagonism of Actinomyces to Fusarium oxysporum cubense.**—*Phytopathology*, xxxiii, 5, pp. 403, 1943.

A culture of a species of *Actinomyces* collected from a compost heap at Port Maria, Jamaica, was found to be capable of dissolving the mycelium of *Fusarium oxysporum cubense*. When the spores of each organism were mixed together in a Petri dish of 2 per cent. soil-extract agar, lysis was strongly in evidence on the fifth day, by which time only small sections of the *Fusarium* mycelium remained. By the ninth day even these had disappeared, while the *Actinomyces* was making normal growth.

LINFORD (M. B.). **Influence of plant populations upon incidence of Pineapple yellow spot.**—*Phytopathology*, xxxiii, 5, pp. 408–410, 1943.

The author discusses and tabulates the results of a plantation experiment at Honolulu, Hawaii, to determine the relation of plant spacing to the incidence of pineapple yellow spot (probably due to the tomato spotted wilt virus) [*R.A.M.*, xix, p. 483]. The outcome of the test confirmed the hypothesis that viruliferous individuals of the insect vector, *Thrips tabaci*, blown in from a distance, were scattered almost uniformly over the field, giving approximately equal numbers of infections, whereas the percentages of yellow spot are inversely correlated with plant population density. Plots with plants 18 in. apart, having only two-thirds as many plants per unit area as those with 12 in. spacing, would be expected to contract 50 per cent. more infections, a figure agreeing reasonably well with the observed value of 57·6 per cent. The incomplete data from the intermediate spacing of 15 in. further tend to support the view that a lower percentage of yellow spot accompanies dense plant populations [cf. ibid., xxi, p. 103].

LOUW (A. J.). **Studies on Septoria passiflorae n.sp. occurring in Passion Fruit with special reference to its parasitism and physiology.**—*Sci. Bull. S. Afr. Dep. Agric.* 229, 51 pp., 4 pl., 4 figs., 7 graphs, 1941. [Afrikaans summary.]

This is a comprehensive study on a new and destructive disease of passion fruit (*Passiflora edulis* and *P. quitensis*) caused by *Septoria passiflorae* n.sp. at French Hoek and Stellenbosch, in the winter rainfall area of Cape Province. The pathogen attacks the leaves, blossoms, fruits, and skins of the Cape, Perfecta, and Yellow varieties of *P. edulis*, the first-named sustaining the most extensive leaf injury in the form of circular to irregular, light brown, sharply defined, necrotic lesions,

5 to 10 mm. in diameter, surrounded by a yellowish zone which may eventually spread over the entire leaf. Under very humid conditions the typical necrotic spots are replaced by indefinite, water-soaked areas, which turn dull green to black, becoming desiccated and shrivelled. On the blossoms the lesions are similar to those on the leaves; the primary infection of the calyx may extend to the stalks, resulting in the premature shedding of the flowers. The small, superficial, roughly circular, sharply defined, brown spots on the fruits tend to coalesce into large, irregular, necrotic, somewhat depressed patches of a hard consistency. On very young shoots the lesions are small, irregularly circular to elongated, and water-soaked, and young stems may wither and die as the result of girdling by a band of necrotic tissue.

Striking cultural differences in rate of growth, colour (carmine to black), and pycnidial development were exhibited by four isolates of the fungus, designated S1b, S2b, S12c, and S13c, the first from yellow and the others from purple fruits of *P. edulis*. All four isolates made perceptible growth within a temperature range of 5° to 35° C., the optimum lying between 25° and 27·5° for S1b, 27·5° and 30° for S2b, and 20° and 25° for S12c and S13c. In water cultures pycnospores of S2b germinated by microconidial budding.

The pycnidia of *S. passiflorae* are globose or depressed-globose, brown to black, subepidermal in substomatal cavities, 50 to 160 μ in diameter, with a circular to ovoid, slightly papillate ostiole, 15 to 24 μ in diameter, and a pseudoparenchymatous peridium, 2·9 to 6·6 μ thick, with a hyaline inner, and a dark brown outer layer. The hyaline, filiform, irregularly curved or straight, continuous to triseptate, attenuated pycnospores with rounded ends varied slightly in the different isolates, range from 11·3 to 31·3 by 1·1 to 2·6 (mean 18·9 by 1·7) μ for S1b, 11·3 to 33·8 by 1·1 to 2·4 (18·9 by 1·6) μ for S2b, 11·3 to 33·8 by 1·1 to 2·6 (21·1 by 1·8) μ for S12c, and 11·3 to 31·3 by 1·1 to 2·6 (19·3 by 1·8) μ for S13c. The hyaline (pale salmon in the mass), filiform, muticate, straight or irregularly curved conidia, borne in clusters on short, simple, hyaline conidiophores, are rounded at the ends and measure 14·4 to 30·4 by 1·6 to 2·9 (23·2 by 2) μ, and the microconidia are continuous, ovoid, hyaline, and smooth.

In inoculation experiments, S1b and S2b were the most actively parasitic of the four isolates on *P. edulis*, while *P. quitensis* was more severely attacked by S12c; *P. coerulea* is apparently immune. The incubation period was nine days at the most favourable temperatures of 25°, 27°, and 30°, and correspondingly longer at those less conducive to infection, which did not occur at all at 10° or 35°. The stomata, which are present only on the dorsal leaf surface, are the sole channels of entry.

Rainfall and temperature were shown to be the decisive factors in the epidemiology and dissemination of the leaf spot in 1938–9 and 1939–40, the former season being characterized by a moderately cool, rainy period from September to November, followed by protracted drought and heat until May, resulting in a severe outbreak of *S. passiflorae*, and the latter by a predominantly cool spring with intermittent rainy spells, the prevailing temperature (56° to 58° F.) being unfavourable to infection.

Systematic pruning and training of the vines, the removal and destruction of infected material, and the application of a copper-containing dust, such as verderame, at 10- to 14-day intervals, are the proposed control measures.

NIELSEN (L. W.). **Studies with silver compounds and mixtures as fungicidal sprays.** —*Mem. Cornell agric. Exp. Sta.* 248, 44 pp., 1 fig., 2 graphs, 1942.

A full account is given of laboratory and greenhouse studies carried out to develop a protective fungicide having silver as the active constituent [*R.A.M.*, xxii, p. 147]. The evaluation of the sprays (70 of which were tested on Chippewa potato plants

inoculated with *Phytophthora infestans*) was based on their fungicidal activity and adhesiveness as estimated by methods [which are fully described] adapted from Hamilton and Weaver (abs. in *Phytopathology*, xxx, p. 7, 1940). The former was determined by inoculating experimental plants previously sprayed on a rotating table at a constant pressure for a definite period with the fungicide and observing the amount of infection that developed; the latter by inoculating plants that had received artificial rain treatment after being sprayed. The most promising results were given by silver oxide, silver iodide, silver hexacyanoferrate (II), silver dichromate, silver dichromate in bentonite, silver sulphite in bentonite, and three silver mixtures containing manganese (II) sulphate, iron (III) sulphate, and iron (II) sulphate, in addition to calcium hydroxide.

Composition studies of the silver nitrate and metal-sulphate mixtures indicated that the best concentration of metal sulphates was one equal to the molecular concentration of the silver nitrate in the respective mixtures. The concentration of the third component, lime, most suitable for maximum adhesiveness of these sprays, differed for each mixture. With the silver and iron (II) sulphate mixture, lime containing sufficient calcium hydroxide to react chemically with the silver nitrate and the iron (II) sulphate gave the most adherent mixture. The relative concentrations of the three components for making this mixture to contain 100 p.p.m. of silver were 0·158 gm. silver nitrate, 0·258 gm. iron sulphate, and 0·154 gm. lime per l. The silver and iron (II) sulphate mixture was the most adhesive of several promising silver sprays, its adhesiveness being about the same as that of Bordeaux mixture (3–3–50). Field tests of the mixture were not undertaken and under such conditions it is possible the spray will not give adequate control. As regards the cost of the spray, 1 lb. silver nitrate would suffice for about 750 gals., and at $6 to $7 per lb. for the silver nitrate the spray would work out at approximately 1 cent. per gal.

MARCUS (O.). **Über das Vorkommen von Mikroorganismen in pflanzlichen Geweben (nach Untersuchungen an Früchten und Samen).** [On the presence of micro-organisms in plant tissues (from observations on fruits and seeds).]—*Arch. Mikrobiol.*, xiii, 1, pp. 1–44, 5 figs., 1942.

The author fully describes and tabulates the results of his experiments at the University of Göttingen on the bacterial, fungal, and yeast contents of normal fruits and seeds of a number of cultivated plants [cf. next abstract]. Up to 93 per cent. of the juniper berries examined were found to harbour *Hormodendrum chlorinum* var. *nigrovirens* or *Alternaria tenuis*, the incidence of the former being high and that of the latter low. *A. tenuis* was also a frequent occupant of summer wheat and of barley, and occurred sporadically in the cores of otherwise entirely healthy-looking apples, accompanied by *Phyllosticta tirolensis* Bubák. *A. secalis* was commonly detected in rye, which also occasionally harboured *H.* [*Cladosporium*] *herbarum*. *Fusarium graminearum* [*Gibberella zeae*] was sparsely represented in barley, and *H. chlorinum* var. *nigrovirens* and *Cephalosporium acremonium* in oats. Only 5·8 per cent. of the gooseberries inspected were colonized by micro-organisms, including *Torulopsis albida* and a species of *Rhodotorula*. *R. glutinis* was an occasional occupant of sour cherries, *Clasterosporium obovatum* was common in *Crataegus oxyacantha*, and vegetable marrows were frequently invaded by *Bacillus vulgatus*, a parasite of the stigmas which does not penetrate deeply into the fruit, and sporadically by *Corynebacterium brunneum*, *H. olivaceum*, and *Acrostalagmus cinnabarinus*.

Discussing the interpretation of his observations, the writer finds no indication of a symbiotic relationship between the micro-organisms and their hosts in any of the cases investigated, some of which, indeed, are indicative of inhibited or suppressed parasitism. Among these are the inhabitants of the cereal seed-grain

(100 per cent. colonization), which were strictly confined to the weakened pericarp tissues, and those of juniper, *Crataegus oxyacantha*, *B. vulgatus* in vegetable marrow, and *P. tirolensis* (a pathogen of stored fruit) in apple. The potential role of the organisms as stimulants to growth requires further investigation.

Niethammer (Anneliese). **Hefen sowie mikroskopische Pilze aus Blüten, ferner von Samen und Früchten.** [Yeasts and microscopic fungi from blossoms, and also from seeds and fruits.]—*Arch. Mikrobiol.*, xiii, 1, pp. 45–59, 1943.

The author records the occurrence of anascosporogenous yeasts and other fungi in the nectars of various flowers and in the 'sterile' [apparently healthy] flesh of numerous fruits, seeds, seed coats, and flowers.

Croen (E.). **Mildewproofing treatments for textile fabrics.**—*Cotton, Atlanta*, cvii, 2, pp. 104–107, 118, 1943.

This is a useful review of recent developments in the United States in connexion with the treatment of textile fabrics for mildew prevention, with special reference to military requirements, the government specifications for various standardized processes being quoted. Among the procedures described are those involving the use of copper naphthenate, ammonium fluoride, copper substitutes, e.g., zinc naphthenate and salicylanilide, phenolic substances, and certain water- and mildew-proofing combinations in which the fungicidal element is usually supplied by copper stearate. Methods of testing the efficacy of the treatment by inoculation of the experimental fabrics with *Chaetomium globosum* [*R.A.M.*, xxii, p. 73] or soil burial are also discussed.

Hopkins (C. J. F.). **A descriptive list of plant diseases in Southern Rhodesia (and their control). Supplement I. January, 1940, to April, 1943.**—*Rhod. agric. J.*, xl, 3, pp. 178–192, 1943.

This list, which supplements that published in December, 1939 [*R.A.M.*, xxi, p. 213], includes all new records made since that date, together with a number of corrections and emendations. Many virus diseases are noted, and the local hosts of tobacco kromnek [ibid., xix, p. 620] are given in an appendix.

Quintanilha (A.). **Doze anos de citologia e genetica dos fungos.** [Twelve years of cytology and genetics of the fungi.]—*Agron. lusit.*, iii, 4, pp. 241–306, 3 pl., 3 figs., 8 diags., 3 graphs, 1941. [French summary.]

This is a survey, accompanied by critical references to the relevant literature, of the studies carried out by the writer on the cytology and genetics of fungi during the twelve years since his initiation into the subject by Kniep in 1928.

Thomas (R. C.). **Composition of fungus hyphae IV : Phytophthora.**—*Ohio J. Sci.*, xliii, 3, pp. 135–138, 1943.

The author's analyses of the hyphal structure and composition of the following nine species of *Phytophthora* [cf. *R.A.M.*, xxi, p. 344] are described: *P. cactorum*, *P. parasitica*, *P. infestans*, *P. capsici*, *P. hydrophila*, *P. pini*, *P. cinnamomi*, *P. melongena*, and *P. citrophthora*. A basic skeleton of chitin was found to have superimposed upon it a mixture of two forms of cellulose, of which one was doubly refractive in polarized light. These were impregnated with fatty acids, which had to be saponified with alcoholic potash before the cellulose could be removed by solution in ammoniacal cupric hydrate. The outside layer consisted of a carbohydrate mixture responding positively to the orcinol-hydrochloride test for pentoses, the presence of a hexose also being indicated. Viewed in polarized light, both young and old cultures of *P.* spp. present an identical, dimly anisotropic appearance, in striking contrast to those of *Pythium*, which are isotropic in the initial stages.

Reed (H. S.). **A short history of the plant sciences.**—vi+320 pp., 34 figs., 1 map, Waltham, Mass., Chronica Botanica Company, 1942. £1. 10*s*.

Included in this manual (Volume VII of a new series of plant science books edited by F. Verdoorn) are chapters on mycology, plant pathology, plant nutrition, and mineral constituents in metabolism. The aspects of these topics discussed comprise, *inter alia*, early works on fungi, the initiation of the scientific period, Pasteur's work, physiologic specialization and heterothallism, biochemistry, mycorrhiza, an epoch of discoveries (1750 to 1850), an epoch of expansion, forest pathology, bacterial diseases, virus diseases, and the control of plant diseases.

Kotte (W.). **Der Pflanzenschutz im Elsass.** [Plant protection in Alsace.]—*Angew. Bot.*, xxv, 1–2, pp. 1–12, 1943.

In connexion with the reorganization of plant protection in Alsace under German administration, a description is given of the topographical, climatic, and agricultural features of the province, of which some 60 per cent. of the total area of 8,300 sq. km. is under cultivation, largely by small farmers with an acreage of under 5 ha. Among the achievements attributed to the German authorities are the substitution of up-to-date seed-grain disinfection for treatment with copper sulphate, and the elimination of potato wart [*Synchytrium endobioticum*] from the foci of infection in the Vosges mountains by the substitution of the German immune varieties for the susceptible French sorts formerly cultivated by the peasantry. 'Degeneration' in the low-lying districts is of the same order of importance as in Baden, and the regular provision of high-grade seed stocks from the mountains is indispensable. The treatment of beet field soils with boron against heart and dry rot has been initiated. The most destructive tobacco disease is wildfire [*Pseudomonas tabaca*], and hops are subject to downy mildew (*Peronospora*) [*Pseudoperonospora humuli*].

Rivers (T. M.), Stanley (W. M.), Kunkel (L. O.), Shope (R. E.), Horsfall (F. L.), & Rous (P.). **Virus diseases.**—Ithaca, New York, Cornell University Press, 1943. $2.00. [Reviewed by T. Francis in *Science*, N.S., xcvii, 2528, pp. 535–536, 1943.]

In this volume of lectures given at Cornell University in 1942 W. M. Stanley discusses the chemical structure and mutation of viruses, and describes his efforts to induce mutants or variants of tobacco mosaic by chemical changes in the virus protein [cf. *R.A.M.*, xxi, pp. 50, 229]. Certain strains of the virus differ in their content of amino acids and it was suspected that the variations in behaviour were related to these differences. Virus chemically modified by extensive coverage of the amino and phenol groups was therefore inoculated into susceptible plants in the hope that the virus produced in the plant would resemble the inoculum. This was not so, for the resultant virus was similar in almost all respects to the usual tobacco mosaic, though virulence for a different host was decreased. Chemical treatment beyond a certain point destroyed activity. L. O. Kunkel discusses the advantage obtained for research purposes by transmitting plant viruses to new hosts.

Rosendahl (R. O.) & Wilde (S. A.). **Occurrence of ectotrophic mycorrhizal fungi in soils of cut-over areas and sand dunes.**—*Bull. ecol. Soc. Amer.*, xxiii, 4, pp. 73–74, 1942.

To verify the assumption that the frequent failure of reforestation by means of direct seeding in soils of old cut-over areas and sand dunes is attributable to the absence of mycorrhizal fungi, an experiment was carried out in the sandy area of central Wisconsin, in which Jack, red, and white pines [*Pinus banksiana*, *P. resinosa*, and *P. strobus*] were sown on plots, protected by wire screens, in

abandoned fields, forested areas, prairie soils, and the like, and in the greenhouse on samples from such soils. Fungi capable of producing mycorrhiza on these species were found to be present in varying numbers in the soils of cut-over areas, including wind-blown sands with a denuded humus layer and fields that have been under cultivation or grazing for periods up to 60 years. Some such soils were located as far as two miles from the boundary of the present forest. Mycorrhizal fungi were invariably absent from the adjacent areas of prairie soils of similar sandy texture. Periodical droughts and damping-off fungi were responsible for widespread seedling failure in field trials.

FRIES (N.). **Über die Sporenkeimung bei einigen Gasteromyceten und mykorrhizabildenden Hymenomyceten.** [On spore germination in certain Gasteromycetes and mycorrhiza-forming Hymenomycetes.]—*Arch. Mikrobiol.*, xii, 3, pp. 266–284, 5 figs., 1941.

In experiments at the Institute for Physiological Botany, Upsala, to determine the conditions for spore germination for certain Gasteromycetes and mycorrhiza-forming Hymenomycetes [*R.A.M.*, xxi, p. 389], it was found that a 'wild' yeast species 'X' induced germination in otherwise sterile species of *Lycoperdon* and *Tricholoma, Scleroderma aurantium, Boletus granulatus*, and *B. luteus* on malt agar.

Under dry conditions the spores of *L. umbrinum* and *S. aurantium* remain viable for at least 22 and 7 months, respectively, while those of *B.* and *T.* spp. appear to be comparatively short-lived.

FRIES (N.). **Vitamin B_1, vitamin B_6 and biotin as growth substances for some Ascomycetes.**—*Nature, Lond.*, clii, 3847, p. 105, 1943.

Continuing his earlier investigations [*R.A.M.*, xviii, p. 335], the author found that all of nine species of *Ophiostoma* (*Ceratostomella*) examined required one or more growth substances to grow on synthetic media [ibid., xxii, p. 218]. At least six species reacted positively to an addition of vitamin B_6 (adermin, pyridoxin), and of these four showed inability to synthesize vitamin B_6. *C. multiannulata* required both B_1 and B_6. Within a number of species B_1-heterotrophy occurred, in one case, *C. pini*, combined with biotin-heterotrophy. In most cases it was unnecessary to add the whole B_1 molecule; supplied with pyrimidin only, the organism produced the thiazole necessary for the synthesis of B_1. Any two species of which one required B_1 but produced B_6, while the other required B_6 but produced B_1, were able to grow together without added growth substances. The lowest concentration of B_6 that was effective was about 10^{-10}. *C. multiannulata*, with the addition of suboptimal amounts of B_6 to a nutrient solution otherwise optimal, produced quantities of mycelium which, within certain limitations, were directly proportional to the amounts of B_6 added. The same held good for *C. ulmi*. Other Ascomycetes examined generally proved to be auxo-autotrophic or B_1-heterotrophic.

Potato spraying and dusting machinery.—*J. Minist. Agric.*, l, 4, pp. 186–187, 1943.

Notes are given on the proper care of potato spraying and dusting apparatus.

PUSHKARNATH. **Good seed Potatoes and how to produce them.**—*Indian Fmg*, iv, 1, pp. 14–17, 4 figs., 1943.

The degeneration of seed stocks due to virus diseases [*R.A.M.*, xix, p. 134] is stated to be one of the most serious problems of seed potato production in India. The most important diseases of this group are leaf roll and mosaic, prevalent both in the hills and the plains, and streak, common on the variety Up-to-Date in the hills of northern India. To obtain healthy seed potatoes the planting of seed plots and the use of suitable varieties and healthy tubers are advocated. It is suggested

that a system of seed certification on the lines of schemes operating in America and many European countries is urgently needed in India.

Baltzer. **Aufgaben der Saatguterzeugung im Kartoffelbau.** [Requirements for seed production in Potato cultivation.]—*Mitt. Landw., Berl.*, lviii, 7, pp. 107–109, 1943.

The responsible authorities have now recognized that the control of potato 'degeneration' diseases is the first step towards the production of sound seed stocks, and with this end in view the planting of peach trees, the alternate host of the aphid vector of the leaf roll, Y-, and A-viruses, has been prohibited in the eastern provinces for the last two years [*R.A.M.*, xxii, p. 268]. Existing peach and apricot stands must be sprayed according to the prescribed schedules for the districts in question. Energetic measures have lately been adopted for the elimination of 'degeneration' from Pomerania, where climatic conditions are ideal for healthy seed production but innovations are strongly resisted by the conservative smallholders and peasantry. As from 1943 the potato varieties sanctioned for cultivation are determined by the local seed-producing concerns, which are then responsible for the annual supply of fresh seed to the growers, a triennial rotation being observed.

Up to 1937 the proportion of 'degenerate' plants allowed in certified seed stocks was 5 per cent., whereas to-day the maximum is 0·4 per cent., reflecting an increasingly stringent tendency in the matter of registration on the part of virus experts: for certified second-year seed the corresponding figures for classes A and B are 0·6 and 1·2 per cent., respectively. During the five years since these changes have been in operation, the health of the seed stocks has markedly improved, and in 1942 only 5 per cent. of the Pomeranian stands submitted were refused certification or withdrawn.

Black (L. M.). **Some relationships between Potato yellow-dwarf virus and the Clover leaf hopper.**—*Phytopathology*, xxxiii, 5, pp. 363–371, 1943.

Clover leafhopper (*Aceratagallia sanguinolenta*) nymphs in the third, fourth, and fifth instars transmitted the potato yellow dwarf virus [*R.A.M.*, xvii, p. 412; xxi, p. 264] in many of the author's experiments, while one case of conveyance by a second-instar nymph is also recorded. No significant difference in mortality between viruliferous and non-infective insects was observed. The incubation period of the virus in crimson clover (*Trifolium incarnatum*) plants varied from one to five weeks, most of the plants developing symptoms during the second and third weeks after one week's feeding or inoculation. The incubation period in the insect ranged from six to ten days (probably longer in individual nymphs). Clover seedlings may be infected by individual insects daily for at least ten days, but a lapse of many days (up to 25 in one instance) is common between two transmissions by the same insect. Nymphs transferred daily to fresh, healthy clover plants retained their infectivity for as long as 44 days, the corresponding period for those fed on rye being 52. The virus was not communicated from viruliferous parents to their progeny through the eggs or sperm.

Black (L. M.). **Genetic variation in the Clover leafhopper's ability to transmit Potato yellow-dwarf virus.**—*Genetics*, xxviii, 3, pp. 200–209, 1943.

Selective breeding through ten generations resulted in the development of two races of the clover leafhopper, *Aceratagallia sanguinolenta* (Prov.), one 'active' and the other 'inactive'. In the last generation 80 per cent. of the 'active' race, 2 per cent. of the 'inactive', and 30 per cent. of the hybrids proved to be capable of transmitting the yellow dwarf virus from crimson clover (*Trifolium incarnatum*) to potato under comparable conditions [see preceding abstract]. Viruliferous

individuals appeared in the 'inactive' race in every generation, while conversely, some members of the 'active' race failed to carry the virus from one host to the other. A slightly but significantly higher percentage of males (43) than of females (38) transmitted the virus, and the former sex was also more 'efficient' (i.e., conveyed the disease to a larger number of plants) than the latter. Evidence was further obtained that the males derived from crosses between 'inactive' males and 'active' females were more 'active' than the females of the same origin or than individuals of both sexes produced by reciprocal crosses.

RAMSHORN (K.). **Über die Wirkung von β-Indolyl-essigsäure auf den sogenannten Kartoffelabbau.** [On the effect of β-indole-acetic acid on the so-called Potato degeneration.]—*Forschungsdienst, Sonderh.* 16, pp. 378–384, 1942. [Abs. in *Chem. Zbl.*, cxiii (i), 21, p. 2725, 1942.]

A deficiency of growth substance being indicated by the unthrifty condition of 'degenerate' potatoes, heteroauxin was administered with the object of promoting vigorous development in the progeny [*R.A.M.*, xvi, p. 705]. The resultant striking improvement in the growth habit and yield of the second-year plants is attributed to the increased mobility of the reserve substances, especially the carbohydrates.

KÖHLER (E.). **Über die unterschiedliche Vermehrungsgeschwindigkeit von Stämmen des Kartoffel-X-Virus.** [On the differential rate of multiplication of strains of the X-virus of Potato.]—*Zbl. Bakt.*, Abt. 2, civ, 23–24, 1 graph, 1942.

The three highly necrotic strains (variants) of the X-virus of potato known as Us, Cs 37, and Bf [*R.A.M.*, xxii, p. 109] were found to multiply at varying rates in inoculated leaves of Samsun tobacco. In one test, by the fifth day of incubation, Us was capable of producing a total of 1,135 single lesions on the leaves of five White Burley tobacco plants, the corresponding number of Cs 37 being only 157, while Bf was not sufficiently advanced for use. In another experiment, in which the three strains were inoculated, a week after incubation, into four Samsun and two White Burley plants, the numbers of lesions produced on the former by Us, Cs 37, and Bf were 319, 552, and 65, respectively, and on the latter, 442, 568, and 154, respectively. The results of a preliminary test had shown that the infection density ratios of the three isolates on Samsun were 159·3: 85·3: 49·8 for Cs 37, Us, and Bf, respectively.

DIMOND (A. E.), HEUBERGER (J. W.), & HORSFALL (J. G.). **Copper spray substitutes.**—*Amer. Potato J.*, xx, 6, pp. 141–153, 1943.

This is a summary of available knowledge of copper spray substitutes for the control of potato diseases, based chiefly on the authors' general experience with new organic materials since 1938. Of the new compounds already on the market, tetrachlorquinone (spergon), tetramethylthiuram disulphide (thiosan and Du Bay 1205 FF), and ferric dimethyldithiocarbamate (fermate, Du Bay 870, and IN-870) have all been proved to give excellent disease control as seed protectants and as foliage sprays in the field on several crops. In addition, there exists a number of other promising materials not yet on the market. The disadvantages of the copper substitutes are their high cost, limited production, high specificity, and low tenacity, but it is believed that further research might show the way of overcoming all or some of them.

BONDE (R.) & SCHULTZ (E. S.). **Potato refuse piles as a factor in the dissemination of late blight.**—*Bull. Me agric. Exp. Sta.* 416, pp. 229–246, 8 figs., 1943.

In this paper the authors give a summarized account of their attempts to determine the primary sources of the infection of potatoes by late blight (*Phytophthora infestans*) in Maine. In the concentrated potato area of Aroostook County the

annual loss from infection ranges from 2 to 15 per cent. of the total crop. In Maine as a whole the annual loss is about 9 per cent. of the total crop, or nearly 4,000,000 bush., in spite of the fact that farmers spend at least $1,000,000 a year on spraying and dusting against the disease.

From 1935 to 1940 the authors attempted to induce epidemics of late blight experimentally by planting diseased seed potatoes in a number of fields. Of 1,410 diseased seed pieces planted, only four produced affected shoots; none of the diseased plants gave rise to an epidemic, and the infected sprouts soon died. In the past two seasons an experimental plot was planted with late blight-infected tubers, the parts showing decay due to other organisms being cut away. Only 4 per cent. of the infected tubers gave rise to late blight-infected shoots. While the disease may sometimes develop as a result of planting infected seed potatoes, this does not seem to be the chief source of infection locally.

In one instance late blight was observed to spread from an infected potato refuse pile to an unsprayed potato field about 200 ft. away. The plants nearest the pile were almost all infected, but incidence decreased as the distance from the pile increased, and very few spots were seen on plants 500 and 600 ft. away. Data obtained in extensive surveys showed that late blight often develops on the plants growing in the cull piles in the early part of the season, before most growers have started spraying. Conditions in the damp piles are very favourable to infection, because a dense mass of vines remains moist and humid for long periods, whereas under normal field conditions the diseased shoots often die before secondary infections can arise. Further, large numbers of infected tubers are concentrated in the cull piles, and the lack of soil over infected tubers at or near the surface of the pile favours emergence and exposure of the young shoots to infection.

In April and May, 1938, about 25 barrels of cull potatoes were deposited in a pile 100 ft. from a potato field. Records of the prevalence of late blight in the field at different distances from the infected refuse pile were taken on 12th July and showed that at distances of 100, 200, 300, 400, 500, and 600 ft. away there were, respectively, 98, 55, 21, 6, 0, and 1 per cent. infected plants, with, respectively, 293, 98, 31, 9, 0, and 1 lesions per 100 plants. In July, 1942, five fields in the vicinity of infected dump piles were examined. At distances of 100 ft. or less, 100 to 200, 300 to 400, 500 to 600, and over 600 ft. from the piles, the first field showed, respectively, 23, 5, 1, 2, and 0 per cent. diseased hills, the second 40, 8, 0, 0, and 0 per cent., and the third 56, 7, 0, 0, and 0 per cent., the fourth 19, 3, 0, 0·5, and 0 per cent., and the fifth 83, 15, 4, trace, and 0 per cent. Spread was mostly towards the north-west, indicating that the conidia had been carried by winds from the south-east.

Drifting mist and fog and wind-blown rains in humid regions are favourable agents for the dissemination of the spores and for the spread of infection. In Aroostook County the disease, when first observed in the field, usually appears as isolated small spots on the top leaves or stems, indicating that single conidia have been carried in from a distance. As a rule, infection appears in this way at about the same time in a number of fields spread over a large area, and this also indicates wind dissemination. In 1936 an acre of unsprayed potatoes were sprinkled on 18th July with inoculum from 50 leaves. The weather was moist but cool, and no symptoms appeared until 24th July. A misty rain and fog accompanied by wind from the south-east prevailed for some days after the spores had developed and almost every plant in an adjacent field for a distance of 500 ft. from the south-eastern edge of the field became infected. No disease was found in the unsprayed fields lying in other directions, or in the fields sprayed shortly before 24th July.

The authors conclude that waste potatoes should not be dumped at all; they should be boiled, burned, incinerated, or fed to livestock.

Potato ridging and Potato blight.—*Gdnrs' Chron.*, Ser. 3, cxiii, 2946, p. 234, 1943.

The manner in which potatoes are earthed up may considerably affect the incidence of blight [*Phytophthora infestans*] at the end of the season. When the fungus develops about August, the spores are washed down by rain from the leaves to the soil. A wide ridge with a hollow at the top tends to catch the rain, which may then carry the inoculum down through cracks in the soil until it comes into contact with the tubers. A well-pointed ridge, on the other hand, throws the rain off the sides, and the spores are more likely to be filtered out from rain soaking down to the tubers through a good covering of soil.

Samuel (G.). **Guarding against blight in Potato clamps.**—*J. Minist. Agric.*, l, 5, pp. 214–216, 1943.

The following recommendations are given for the control of potato blight [*Phytophthora infestans*]. Precautionary measures, in addition to spraying, should consist in (1) growing resistant varieties, such as Majestic or Arran Banner, (2) early planting to get maximum growth before the appearance of the disease, and (3) good ridging to protect the tubers in the soil [see preceding abstract]. Spraying, which is the chief control measure, should be made a routine practice in the Fenlands and the south-west of England where blight appears early in the season; an additional treatment in seasons when blight is prevalent is of great value. To clamp a sound crop it is advisable to wait at least ten days after the tops had been completely killed off by the disease before lifting, in order to prevent contamination of sound tubers with fungal spores from the haulm. Where a delay in lifting is impracticable, the haulm should be burnt off before lifting, or, in the case of small fields, cut by hand and carted off. The best method of haulm destruction is spraying with sulphuric acid, but as the handling of acid is difficult and requires special equipment, it is not recommended for general use. Fairly good results were obtained in small-scale tests with two other substances: (1) a mixture of crushed or granulated copper sulphate and salt at a strength of 2 or 3 per cent. of each, and (2) tar oil winter wash, as used for spraying fruit trees. Both are recommended for trial on a field scale, and the farmers requested to send in brief reports on the results to the author. Another method of avoiding infection of the tubers from blighted haulms is to lift the crop during a spell of dry weather, as the blight spots on the leaves tend then to dry up somewhat and spore less freely. This method, however, is more suitable for the lifting of earlies and early maincrops for immediate sale than for storage in clamps.

Richards (O. W.). **The Actinomyces of Potato scab demonstrated by fluorescence microscopy.** —*Stain Tech.*, xviii, 2, pp. 91–94, 1 fig., 1943.

The agent of potato scab, *Actinomyces scabies*, was shown by experiments at the Spencer Lens Co., Buffalo, New York, to be susceptible of selective impregnation with carbol-auranin and to fluoresce bright yellow on exposure to ultra-violet radiation. The staining technique is carried out at room temperature and no counter-stain is used. This method confirms Lutman's conclusion that the hyphae of the fungus are intercellular and grow within the middle lamellae [*R.A.M.*, xxi, p. 156]. After complete removal of the paraffin the sections are stained four minutes in carbol-auranin, washed, de-stained in a 0·5 per cent. solution of sodium chloride in 70 per cent. alcohol with 0·5 ml. hydrochloric acid per 100 ml., washed, and mounted in glycerine.

Défago (G.) & Gasser (R.). **La dartrose de la Pomme de terre.** [Potato dartrose.] —*Ber. schweiz. bot. Ges.*, liiiA, pp. 480–499, 4 pl., 1 graph, 1943.

In 1937, and again in 1941, 'dartrose' (*Colletotrichum atramentarium*) was

responsible for heavy losses among the potato crops in various parts of the canton of Valais, and is stated to be, in general, a frequent concomitant of hot summers in Switzerland. The somewhat nondescript symptoms of the disease tend to complicate its diagnosis. In pure culture on potato agar several races of the fungus could be differentiated on the basis of the size and density of the sclerotia, the colour of the conidial masses, the pigment diffused through the medium, and other peculiarities. The dimensions of the conidia ranged from 15 to 27 by 3 to 5·6 μ, while three isolates further yielded ovoid microconidia, 7 to 8 by 4 to 5 μ. The sclerotia measured 0·06 to 3 mm. in diameter, and some were furnished with blackish, acicular, pluriseptate setae, 40 to 250 (average 130 to 160) μ in length.

In an exclusively synthetic solution *C. atramentarium* was found to be completely auxo-autotrophic in respect of aneurin. The optimum temperature for growth lies between 28° and 30° C., the minimum and maximum being 6° and 38°, respectively. Sectoring of the type described by Hiroe for *Ophiobolus miyabeanus* and other fungi [*R.A.M.*, xvii, p. 337] was observed in agar cultures. The inoculation of plants and tubers with the agent of 'dartrose' was successful only on young material and at fairly high temperatures (above 21° for plants and between 26° and 32° for Eersteling [Duke of York] tubers. Tomatoes were also susceptible at temperatures above 20°.

Direct control of *C. atramentarium* is thought to be impracticable. Diseased tubers should be isolated or disinfected as for *Rhizoctonia* [*Corticium solani*], and the aerial portions of the plants burnt or deeply buried.

Douchez (Mlle Y.). **Sur les galles des racines de Pomme de terre provoquées par le Spongospora subterranea (Wallr.) T. Johnson.** [On the Potato root galls induced by *Spongospora subterranea* (Wallr.) T. Johnson.] — *Ann. Inst. Pasteur*, lxviii, 4–6, pp. 351–353, 1942.

The writer studied the histogenesis of the potato root galls produced by *Spongospora subterranea*. From the moment of entry of the plasmodium into the host the cortical cells are disorganized, while those of the phloem and cambium, invaded in their turn, undergo hypertrophy and attain six or seven times their normal size, at the same time losing their specific characters and giving rise to a compact, undifferentiated, large-celled parenchyma which constitutes the basic tissue of the tumour. Before the penetration of the fungus the host nucleus swells and the cells are then rapidly invaded by plasmodia, the nuclei of which encircle the nucleus of the host. The latter, together with the large quantity of starch in the cytoplasm, is ingested by the plasmodium. In the deeper layers of the tumour tissue the starch is much less plentiful and the plasmodia are replaced by sporangia. The hypertrophied phloem and cambium cells displace the xylem and proceed for a considerable distance into the misshapen fibro-vascular cylinder in the centre of the root. The disturbances consequent on this process tend to dislocate the cambial layer, the aberrant cells of which ultimately produce woody or phloem elements; sieve-tubes or vessels may, in fact, be scattered through the tumour tissue.

Not only do the plasmodia induce hypertrophy in the invaded cells themselves, but they act similarly on those at a distance, causing hyperplasia of the cambial tissue and disorientation of the phloem and xylem arising from it. In none of these newly formed elements is the parasite actually present, but certain hypertrophied cells in proximity to the root were occupied by myxamoebae, the origin of which is at present obscure.

Sherf (A. F.). **A method for maintaining Phytomonas sepedonica in culture for long periods without transfer.** — *Phytopathology*, xxxiii, 4, pp. 330–332, 1943.

Slants of Burkholder's medium were inoculated with 16 cultures of *Phytomonas*

sepedonica [*Corynebacterium sepedonicum*], the causal organism of potato ring rot, and covered ten days later with a layer of sterile mineral oil, the tubes then being plugged with cotton and held at room temperature. Viability was tested at monthly intervals by the removal of a 2 mm.-loopful of cells, which were incubated on a fresh agar slant for 14 days. After ten months under oil 10 (62·5 per cent.) of the cultures were still in a vigorous condition, and at the end of $1\frac{1}{2}$ years four (25 per cent.) were viable and induced the typical ring-rot symptoms on leaves and tubers. In another series of ten cultures placed under oil three months earlier than the preceding, only two out of eight (two had been meanwhile lost through fungal contamination of the oil) were still viable after 17 months, while at the end of $1\frac{3}{4}$ years all were dead.

Phytomonas [*Pseudomonas*] *medicaginis* var. *phaseolicola* and *Phytomonas* [*Xanthomonas*] *phaseoli*, the agents of halo and common blight of beans [*Phaseolus vulgaris*], respectively, retained their viability and pathogenicity for at least 13 to 18 months under oil, and *Fusarium* [*solani* var.] *eumartii*, *F. avenaceum*, *F.* [*bulbigenum* var.] *lycopersici*, and *Alternaria* sp. for a minimum period of six months.

Kreutzer (W. A.) & McLean (J. G.). **Location and movement of the causal agent of ring rot in the Potato plant.**—*Tech. Bull. Colo. agric. Exp. Sta.* 30, 28 pp., 5 figs., 1943.

Infection of the cut surfaces of potato tubers by *Phytomonas sepedonica* [*Corynebacterium sepedonicum*] was reduced by apparent suberization and cork formation occurring in a 24- to 48-hour period. The removal of a layer of tissue 5 mm. in thickness from the cut ends of knife-inoculated tubers greatly reduced the resultant infection (from 84·6 to 3·3 per cent.). Plants arising from tubers painted over the unbroken surface with a suspension of *C. sepedonicum* developed no infection in the greenhouse and very little in the field, whereas the same treatment applied to injured surfaces caused fairly heavy infection. Tubers in which typical ring-rot symptoms were evident produced diseased sprouts earlier than those artificially inoculated or naturally infected ones showing no symptoms. The lower portions of diseased vines developing from both naturally and artificially infected tubers usually contained greater numbers of bacteria than the upper parts. *C. sepedonicum* was also more prevalent in the roots than in the stolons. Some vines of severely infected plants showed little or no infection and the tubers from such plants produced a healthy new growth. The migration of the pathogen took place principally in the xylem elements, whence escape into the adjoining parenchymatous tissues was frequent.

Infected tubers, with or without recognizable ring-spot symptoms, and uninfected tubers were produced by diseased plants, while tubers showing no symptoms frequently failed to reveal the presence of the organism when subjected to the Gram-stain technique but later gave rise to infected vines. In other symptomless tubers the bacterium was often encountered at one point only in the vascular cylinder. However, tubers actually showing ring-rot symptoms gave a Gram-positive stain reaction and, if they did not rot, invariably produced diseased vines.

Neither pure cultures of *C. sepedonicum* nor material taken from the necrotic, yellow rings of affected tubers induced soft rot on inoculation into sound tubers, but inoculum from the completely disorganized tuber tissues did so. Slices from tubers attacked by *C. sepedonicum* tended to decay more rapidly on inoculation with *Erwinia carotovora* than similarly treated slices free from ring rot.

In comparative inoculation experiments on Bliss Triumph potato and Bonny Best and Earliana tomato, *C. sepedonicum* was found to move more rapidly in the latter than in the former, and invariably in a downward direction except where the stem was completely removed and a new terminal shoot produced: in such cases the tissue of the fresh growth was usually found to contain bacteria. The

movement of the pathogen was extremely slow, 45 days being required for its progression from the upper leaves or stem to the underground parts.

MARTEN (E. A.), LOWTHER (C. V.), & LEACH (J. G.). **A differential medium for the isolation of Phytomonas sepedonica.** *Phytopathology*, xxxiii, 5, pp. 406-407, 1 fig., 1943.

In attempted isolations of *Phytomonas sepedonica* [*Corynebacterium sepedonicum*] from severely rotted potato tubers, the pathogen is apt to be overgrown by secondary organisms of the soft-rot type, and a differential medium has therefore been devised to overcome this difficulty. It is based on Mallmann's observation (*J. Bact.*, xlii, p. 295, 1941) as to the inhibition of Gram-negative bacteria by potassium dichromate, which permits the growth of Gram-positive species. The basic ingredients are Burkholder's medium [*R.A.M.*, xviii, p. 53] and a 1 in 1,000 solution of C.P. potassium dichromate, which are prepared in separate flasks and sterilized. A heavy suspension of the yellowish exudate from the ring-spot lesion is made in sterile water, from which loop dilutions are made to a series of duplicate plates. The liquefied agar, cooled to 50° C., is mixed with the potassium dichromate in dilutions, e.g., of 1 in 9,000, 1 in 12,000, and 1 in 15,000, some 10 ml. of the medium being poured over the bacterial suspension and thoroughly mixed. The cultures are incubated at 22° in a moist chamber, and after seven to nine days, pin-point colonies of the bacteria begin to develop in the agar.

PALM (B.). **Ett konidieliknande vilstadium hos en Fomes-art.** [A conidium-like resting stage in a *Fomes* species.] *Svensk bot. Tidskr.*, xxxvii, 2, pp. 200-201, 2 figs., 1943.

Attention is drawn to the development in pure cultures of *Fomes lamaoensis*, a virulent pathogen of tea and *Hevea* rubber roots in the tropics, of a hitherto unrecorded conidium-like stage. On the mycelium in culture oidia are first produced, apical cells of individual hyphae becoming detached from one another in the usual way by the dissolution of the middle lamella. Such oidia are usually formed in large masses and the detached cells may develop directly into a new mycelium. In the course of six weeks or so, when a pseudoparenchymatous tissue has been built up, the terminal cell or cells of the short, undifferentiated hyphae arising here and there from this tissue become thick-walled and develop protuberances. When only one apical cell is involved the structure somewhat resembles a spiked club, but occasionally four or five of the uppermost hyphal cells develop in the same characteristic manner. Only after a long resting period did a few of these gemmae germinate, and their significance in the life-history of the fungus is probably negligible, though from a taxonomic and morphological angle their existence is of considerable interest.

NIETHAMMER (ANNELIESE). **Weitere Beiträge über Verbreitung und Leben mikroskopischer Bodenpilze.** [Further contributions regarding the distribution and biology of microscopic soil fungi.] *Arch. Mikrobiol.*, xii, 3, pp. 312-328, 4 figs., 1941.

Continuing her studies at the German Technical College, Prague, on the distribution and biology of soil fungi [*R.A.M.*, xvi. p. 557; xix, p. 675, and next abstract], the writer enumerates the species isolated from various types of waste and cultivated ground (namely, waste land, pastures, woods or forests, arable) in north-eastern Styria, together with some samples from Saxony and Czechoslovakia, and gives notes on the morphological and cultural characters of the more important, including *Mucor hiemalis*, *M. silvaticum*, *Zygorrhynchus moelleri*, *Penicillium notatum*, *P. suavcolens*, *P. expansum*, *P. luteum*, *Botrytis cinerea*, *Dematium* [*Pullularia*] *pullulans*, *Cladosporium herbarum*, *Fusarium dimerum*,

F. orthoceras, *F. bulbigenum*, *F. solani* and its var. *martii*, and *Arthrobotrys arthrobotryoides* (for which the soil is stated to be a new habitat).

Niethammer (Anneliese). **Weitere Beiträge über mikroskopische Bodenpilze.** [Further contributions regarding the microscopic soil fungi.]—*Arch. Mikrobiol.*, xiii, 1, pp. 60–73, 1941.

In this paper, describing the writer's analyses of soil samples from a limited area of the western Sudetenland, Czechoslovakia [cf. preceding abstract], attention may be drawn to the following points. In culture experiments the microflora was more abundant and of greater variety at a temperature of 20° to 23° than at 32° to 34° C. Janke's observations (*Arch. Mikrobiol.*, v, p. 338, 1938) as to the association of certain bacteria with the soil fungi were confirmed. Many of the fungi from moorland soils, in which cellulose-fermenting bacteria are absent, flourished on cellulose, including the almost ubiquitous *Trichoderma koningi* [*T. viride*], *Fusarium oxysporum*, *F. orthoceras*, *F. dimerum*, *F. merismoides* var. *chlamydosporum*, and *F. equiseti*.

Wallace (T.). **The diagnosis of mineral deficiencies in plants. A colour atlas and guide.**—vi+116 pp., 114 col. pl., 1 diag., London, H.M. Stationery Office, 1943. 10*s*. net.

This useful publication has been written primarily for technical officers and advisers concerned with crop production, but will also prove helpful to progressive growers and gardeners. The five chapters into which the text is divided deal with the essential points of plant nutrition, soils in relation to the supply of mineral nutrients, methods of determining deficiencies in crops, visual symptoms of such deficiencies, and the use of the visual method of diagnosis in the field. The symptoms of the deficiencies in the different crops are described and tabulated, and the effects of such complicating factors as weather, soil conditions, pests and diseases, mineral toxins, and mechanical injuries are discussed. A salient point of the author's method is the use of indicator plants, in which the special symptoms shown for each deficiency are unlike those for other deficiencies, and very pronounced. The plants selected (which are tabulated, with brief descriptions of the special symptoms) are also highly susceptible to the various deficiencies. The coloured plates arranged in four groups are a feature of the work.

Keyworth (W. G.). **A Phytophthora disease of the Hop in Great Britain.**—*Gdnrs' Chron.*, Ser. 3, cxiii, 2946, p. 238, 1943.

In September, 1942, a disease of Brewer's Gold hops resembling the black root rot (*Phytophthora cactorum*), previously reported from New Zealand [*R.A.M.*, xviii, p. 38] but new to Great Britain, was observed on two Kentish farms and one in Sussex. The diseased plants (87 out of 1,000 on one farm and 30 or 40 on another) occurred in groups, infection apparently spreading from one or more foci. One of the most conspicuous features of the root rot, as it appears in south-eastern England, is a dark brown discoloration of the vascular tissues of the roots, stock, and bine bases, which was not mentioned in connexion with the New Zealand outbreak, but in view of other similarities in the symptoms, including decay of the cortical tissues and wilting and death of the bines, the etiology of the two forms of the trouble is believed to be identical. Preliminary inoculation experiments with the isolated fungus, which resembles *P. cactorum*, on hop cuttings gave positive results, the typical brown discoloration of the wood developing at the basal ends, from which reisolation was also effected.

Magie (R. O.). **The epidemiology and control of downy mildew on Hops.**—*Tech. Bull. N.Y. St. agric. Exp. Sta.* 267, 48 pp., 3 figs., 8 graphs, 1942.

Since it was first recorded in New York in 1928 [*R.A.M.*, viii, p. 634], downy

mildew (*Pseudoperonospora humuli*) has become the most destructive disease of hops in the State, and its economic control is now a prerequisite for successful hop cultivation. The problems of its epidemiology and control vary greatly under seasonal and regional conditions. In this paper the results of studies conducted at Geneva and Waterville from 1937 to 1941 are described, some of which have already been noticed from other sources [ibid., xviii, p. 236; xix, p. 200; xx, p. 246; xxi, p. 245].

Sporangia of *P. humuli* held at 24°, 20°, 15°, and 10° C. suspended in water began to germinate after 1, 1¼, 1½, and 2 hours, respectively, and completed the liberation of swarm spores in 1½, 2, 2½, and 4 hours, respectively. The optimum temperature for germination was between 15° and 20°, with a minimum at 5° and a maximum at 28°. Oospores germinated at temperatures between 5° and 20° after wetting periods of 4 to 16 days. Zoospores began to germinate in 2½ to 3½ hours at 15° to 24°, or 1 hour earlier when pieces of hop leaves were added to the suspension. Germination of the zoospores succeeded best in concentrated suspensions and in suspensions to which calcium citrate or a hop leaf was added; it was erratic and sparse in distilled water. Under conditions of laboratory and greenhouse temperature (18° to 24° and 20° to 35°), humidity, and light, about 10 per cent. of the sporangia survived nine days' drying on cut hop leaves and practically all were dead after 16, while at 5° and 10° in dark refrigerators some were still viable after 40 days. When separated from the host plant, on the other hand, the sporangia lived only a few hours. The time required for germination was found to increase with age, the older sporangia needing 3 to 4 hours of wetting at an optimum temperature. In the field 4 per cent. of the sporangia survived a severe drought for about one month. Zoospores in diluted suspensions prepared by atomizing the leaf with a minimum amount of distilled water remained motile only for a few hours at 10° to 20°, few of them germinating, but when a living leaf was added to similar suspensions, they were still active after five days at 10° and two days at 20°, and many germinated. In suspensions prepared by soaking the leaves in distilled water for 15 minutes, zoospores survived for one day at 10° and for several hours at 20°. Oospores germinated only after a dormant period of several months and survived 2½ years of dry storage at laboratory temperature or at –18°.

In infection experiments with sporangia the shortest periods necessary for infection of potted plants at 24°, 18°, 13°, and 10° were 1½, 2, 4, and 6 hours, respectively, the heaviest infection occurring on plants incubated for 24 hours at 13° and 18°. Maximum infection was produced by placing fresh sporangial suspensions directly on the leaf, while only about half as many lesions developed when the same suspensions were held over till zoospores had been produced. Sunlight proved very destructive to sporangia on inoculated plants, few lesions developing after 12 hours' exposure and none after 24. Old leaves were more resistant than young ones, and leaves of plants kept at 24·5° grew progressively more resistant than those at 18°.

The development of epidemics of downy mildew is outlined as follows. The oospores of the fungus overwintering in the soil cause the primary infection of young shoots. This results in the formation of basal spikes, which initiate the production of secondary inoculum (sporangia) within two to three weeks after the beginning of new growth of the host. Sporangia are produced throughout the entire growing season whenever the relative humidity is high at night. They are carried by wind from the basal spikes and lesions on the lower leaves to the upper part of the plant, and later, by rain, from the upper part downwards. The limiting factor in the development of epidemics is the frequency of suitable infection periods between late May and mid-August.

The following recommendations on control are given in the light of experiments carried out during 1936 to 1941. Sanitary practices, especially important in low-

lying sites, should consist mainly in the elimination of basal spikes before they sporulate and in frequent pulling of extra growth ('suckers') at the bases of the plants. New plantings should be made in fields with enough air drainage to dry the plants quickly after rains or dews. In established plantings adjacent hedgerows and trees should be removed, escaped hops should be destroyed within a mile, the vines stripped for the first few feet, and fewer vines trained. An effective spraying programme for most hop yards in the State would consist of four bi-weekly applications of Bordeaux 6-4-100 or yellow cuprocide 1½-100, beginning early in June. When epidemic outbreaks require immediate attention, dusting with copper-lime, 25-75, or cuprocide-sulphur, 7-93, proved useful in addition to spraying. Home-made Bordeaux was found to protect new growth between sprays better than did other copper or zinc materials tested. Bordeaux injury to young plant tissues and stunting of cones were observed only when the spray was applied through guns at the rate of about 400 gals. per acre, but not when applied through fixed nozzles at a lower rate. Leaf injury by Bordeaux and zinc oxide was reduced by adding ¼ per cent. of cottonseed oil to the sprays. The results of comparative resistance tests showed that several varieties were fairly resistant to cone and leaf infection as well as to basal spiking. Of these, Brewer's Gold is recommended as apparently of commercially good quality. On resistant varieties downy mildew can be controlled in most seasons with one application of Bordeaux given about seven days after the beginning of the blossoming or burr period.

Hatton (R. G.), Beard (F. H.), & Salmon (E. S.). **New varieties of Hops.**—*J. Minist. Agric.*, l, 4, pp. 187–189, 1943.

Notes are given on five new hop varieties tested for some years at East Malling Research Station, and now being grown in commercial gardens, viz., Brewer's Favourite (somewhat susceptible to downy mildew [*Pseudoperonospora humuli*] but controllable by rigorous 'spiking' and spraying), Quality Hop, Bullion Hop (both not particularly susceptible), Fillpocket (resistant in the cones), and Brewer's Gold (not particularly susceptible to downy mildew but sometimes attacked by nettlehead).

Chona (B. L.). **Red-rot of Sugarcane and its control.**—*Indian Fmg*, iv, 1, pp. 27–32, 7 figs., 1943.

This is a popular account of the severe epidemics of red rot of sugar-cane (*Colletotrichum falcatum*) [*R.A.M.*, xxii, p. 197] reported from various localities in the cane belt of the eastern United Provinces and northern Bihar during recent years. For the control of the disease growers are advised to carry out systematic roguing of diseased clumps throughout the season, to use only healthy seed, to adopt a long rotation, to treat the cuttings with fungicides prior to planting, to avoid planting in October when there is abundant inoculum present, and to introduce seed plots for growing healthy seed. It is suggested that eventually a co-ordinated scheme of seed nurseries should be instituted. At present a nucleus of this plan is being organized by the Sugar-Cane Specialist, Bihar, with the co-operation of progressive growers and sugar factory-owners.

Gäumann (E.). **Über die Entwicklung und die Wirtswahl einiger schweizerischer Rostpilze.** [On the development and choice of host of some Swiss rust fungi.]—*Ber. schweiz. bot. Ges.*, liii A, pp. 465–479, 5 graphs, 1943.

Three new species of *Puccinia* are described and some additional information concerning *Melampsora larici-epitea* is presented in this paper. In the autumn of 1939 the author collected teleutospores of the rust on *Salix retusa* (*M. larici-epitea* f. sp. *larici-retusae*), which in the following spring were transferred to larch, the uredospores thus obtained being used for cross-inoculations on 15 *S.* spp., of which

nine proved to be more or less susceptible, viz., *S. alpicola*, *S. foetida*, *S. hastata*, *S. helvetica*, *S. nigricans*, *S. waldsteiniana* (all new hosts for the f. sp. *larici-retusae*), *S. herbacea*, *S. retusa*, and *S. serpyllifolia*; one slightly so (*S. reticulata*); and the remaining five, namely, *S. alba*, *S. caesia*, *S. caprea*, *S. purpurea*, and *S. repens*, immune. *S. hastata* and *S. nigricans* are collective hosts, the former for f. sp. *larici-reticulatae* and the latter for f. sp. *larici-purpureae*.

Greene (H. C.). **Notes on Wisconsin parasitic fungi. II.**—*Trans. Wis. Acad. Sci. Arts Lett.*, xxxiv, pp. 83–98, 1942.

Continuing his earlier paper [*R.A.M.*, xxi, p. 100], the author gives brief descriptive notes on parasitic fungi collected chiefly in the southern parts of Wisconsin in 1940 and 1941. A section is devoted to additional hosts of fungi previously recorded on others. The records include *Microsphaera alni* var. *extensa* on red oak (*Quercus rubra*) [ibid., xix, p. 364], *Cercospora variicolor* on cultivated *Paeonia albiflora*, *C. carotae* on carrot, and *Sporonema trifolii* n.sp. on leaves of red clover (*Trifolium pratense*). *S. trifolii* is characterized by amphigenous, often somewhat flattened pycnidia borne on elongate, brown or blackish-brown spots, and hyaline, cylindric, straight or slightly curved, very variable conidia measuring 4 to 9 by 1·3 to 3 (mostly 5·5 to 7·5 by 1·5 to 2·5) μ.

Da Camara (E. de S.) & Da Luz (C. G.). **Mycetes aliquot Lusitaniae V.** [Some fungi of Portugal V.]—*Agron. lusit.*, iii, 4, pp. 307–321, 16 figs., 1941.

The present instalment of the authors' critically annotated list of Portuguese fungi [*R.A.M.*, xxi, p. 504] comprises 28 species, of which six are new, including *Fusicoccum acaciae* on *Acacia*, *Macrophyllosticta* (*Phyllosticta*) *hydrangaecola* and *Ellisiella hydrangae* on *Hydrangea hortensis*, and *Melanconium jasmini* on jasmine.

Shear (C. L.). **Conserving names of fungi.**—*Mycologia*, xxxv, 3, pp. 267–271, 1943.

In these comments on some problems of nomenclature the author expresses the view that much time and effort are wasted in following too rigidly the law of priority in selecting and typifying generic names. It is pointed out that for most of the older genera no single author really defined the genus according to its present concept. Instead of stressing dates and priority the author advocates conserving generic names. He maintains that many of the names established by pre-Friesian authors should be recognized whether they have been adopted or approved by Fries or not. It is suggested that a major effort should be directed towards selecting types which will fix the names in accord with the best present usage.

Noll (A.). **Über den Nachweis von Rostmyzel im Gewebe der Wirtspflanze.** [On the detection of rust mycelium in the tissue of the host plant.]—*Angew. Bot.*, xxv, 1–2, pp. 24–28, 1 fig., 1943.

Holz's cotton blue stain for the detection of the scab (*Fusicladium dendriticum*) [*Venturia inaequalis*] mycelium in apple leaves [*R.A.M.*, xv, p. 661] was used with equal success for locating the hyphae of certain cereal rusts, bean rust (*Uromyces phaseoli*) [*U. appendiculatus*], and flax rust (*Melampsora lini*) in the host tissue.

Dobbs (C. G.). **A Mucorine parasite on Penicillia.**—*Nature, Lond.*, cl, 3802, p. 319, 1 fig., 1942.

A *Piptocephalis*, which does not correspond closely to any described species, but is nearest to *P. tieghemiana*, was found to grow parasitically on cultures of several unnamed species of *Penicillium*, as well as on *P. roqueforti*, *P. notatum*, *P. pfefferianum*, *P. glabrum*, and also on *Mucor mucedo*+ and —, *M. hiemalis* + and —, and *Aspergillus niger*. The parasitism, when it occurs, is strongly marked and results in a conspicuous growth of white (ageing to buff) 'conidiophores'

above the host. This is believed to be the first report of a Mucorine parasite on moulds other than another member of the Mucorales. Susceptibility to the parasite might sometimes provide, it is suggested, a useful additional character for distinguishing species of *Penicillium*.

CLAYTON (E. E.), SMITH (T. E.), SHAW (K. J.), GAINES (J. G.), GRAHAM (T. W.), & YEAGER (C. C.). **Fungicidal tests on blue mold (Peronospora tabacina) of Tobacco.** *J. agric. Res.*, lxvi, 7, pp. 261–276, 4 figs., 1943.

In field and greenhouse tests with emulsified oil sprays against blue mould of tobacco (*Peronospora tabacina*) [*R.A.M.*, xxi, p. 505], it was found that oils containing appreciable amounts of linoleic, eleostearic, or licanic glycerides, such as soy-bean, linseed, cottonseed, tung, oiticica, and peanut oils, are strongly fungicidal, whereas those containing lauric, myristic, palmitic, chaulmoogric, oleic, and stearic glycerides, such as olive, castor, palm, coconut, chaulmoogra, beef tallow, pine, and paraffin oils, are of no fungicidal value. The tobacco leaves sprayed with a fungicidal oil showed numerous oil globules in the intercellular spaces, and such leaves were resistant to fungal attack.

Copper-oil sprays were generally more effective than oils alone, most successful being the cupric oxide-cottonseed oil mixture; copper oxide alone was almost entirely ineffective. Of the emulsifiers tested with copper-oil mixtures, only a few of the complex sulphonated alcohol type proved satisfactory.

In an attempt to find substitute materials for copper 122 organic compounds were tested. Of these the best results were obtained with benzyl salicylate with 1 per cent. oil, and bismuth salicylate without oil [ibid., xxii, p. 115]. Spore germination tests showed that (1) cuprous oxide inhibited the germination of spores at $\frac{1}{8}$ spray strength, (2) bismuth salicylate was only $\frac{1}{4}$ to $\frac{1}{16}$ as toxic as cuprous oxide, and (3) cottonseed oil was non-toxic at full spray strength. It is concluded, therefore, that fungicidal value cannot be measured in terms of ability to inhibit spore germination.

VALLEAU (W. D.), JOHNSON (E. M.), & DIACHUN (S.). **Tobacco diseases.**—*Bull. Ky agric. Exp. Sta.* 437, 60 pp., 34 figs., 1942.

This bulletin is a revised edition of *Bull.* 362, published in 1936 [*R.A.M.*, xvi, p. 213]. It is on the same lines as the earlier one, but devotes a separate section to tobacco disease control in general.

MCLEAN (RUTH A.). **Observations on Cercospora leaf spot of Tobacco and the question of varietal resistance.**—*Phytopathology*, xxxiii, 5, pp. 354–362, 1 fig., 1 graph, 1943.

Flue-cured tobacco at Oxford, North Carolina, was attacked in the early part of the exceptionally hot and dry 1941 growing season by *Cercospora nicotianae*. The circular to angular, necrotic areas, 0·5 to 5 mm. in diameter, were more suggestive of the brown spot caused by *Alternaria longipes* than of the actual pathogen, the identity of which was, however, established when a protracted rainy spell in August induced abundant sporulation in a large percentage of the lesions. Several varieties, e.g., Adcock Pinkney Arthur, were almost free from spots for the tenth leaf from the top of the plant, whereas others, Gold Dollar for instance, were heavily infected. Evidence is adduced in favour of the hypothesis that the apparent differences in susceptibility were probably due to the earlier ripening of the lower leaves of one variety than of those of the other, rather than to any specific divergence in reaction to the pathogen. In all varieties the upper five leaves were definitely spotted, but markedly less so than the lower ones, the counts being progressively higher the lower the position of the leaf on the stalk.

Foster (H. H.). **Resistance in the genus Nicotiana to Phytophthora parasitica Dastur var. nicotianae Tucker.**—*Phytopathology*, xxxiii, 5, pp. 403–404, 1943.

None of the 13 species of *Nicotiana* tested in the greenhouse at the Tobacco Institute of Puerto Rico, Rio Piedras, for their reactions to black shank (*Phytophthora parasitica* var. *nicotianae*) proved to be immune under the exacting conditions of the soil inoculation experiments, but some degree of resistance was shown by plants of transplanting age only of two varieties of *N. tabacum*, Florida Rg and Tobacco Institute 150 (53 A). Two commercial varieties, Virginia No. 9 and Utuado X No. 1, susceptible in the greenhouse, gave some evidence of resistance in the field. Three other species, *N. repanda*, *N. rustica*, and *N. longiflora*, were definitely resistant to the disease. In the first-named, resistance appeared to be located primarily in the roots, the active infection present in the aerial organs being 'corked off' on arrival at the transition zone between stem and roots, and the new stem and leaf growth showing no symptoms. *N. repanda*, previously reported to be resistant to other important tobacco diseases [*R.A.M.*, xix, p. 307], may prove of value in interspecific crossing with *N. tabacum*, but F_1 plants failed to initiate new growth after transplanting.

Jenkins (Anna E.) & Grodsinsky (L.). **Sphaceloma on Willow in New Zealand.**—*Trans. Brit. mycol. Soc.*, xxvi, 1–2, pp. 1–3, 1 fig., 1943.

The fungus causing a disease of crack willows (*Salix fragilis*) and, less frequently, weeping willows (*S. babylonica*) in New Zealand, reported in 1926 by Murray under the name of *Gloeosporium capreae* [*R.A.M.*, v, p. 707], is here interpreted, on the basis of Murray's description, as a species of *Sphaceloma* and named *S. murrayae* n.sp. It is believed to be the first record of any species of this genus on *Salix*.

Graves (A. H.). **Chestnut breeding work in 1942.**—*Rep. Brooklyn bot. Gdn, 1942* (*Brooklyn bot. Gdn Rec.*, xxxii, 2), pp. 78–80, 1943.

Further details are given of chestnut breeding for resistance to *Endothia* [*parasitica*: *R.A.M.*, xxii, p. 185] at Brooklyn Botanic Garden, New York.

Miller (P. W.). **Current investigations on Walnut blight and recommendations for its control in war-time.**—*Rep. Ore. St. hort. Soc., 1942*, pp. 142–146, [? 1943].

In further work on the control of walnut blight [*Xanthomonas juglandis*: *R.A.M.*, xxi, p. 310] in Oregon during 1942, when infection was extremely severe in most parts of the Pacific North-west, two applications of yellow cuprous oxide at the rate of 1½ lb. in 100 gals. water, plus 1 pint ortho adhesive, given in the middle pre-bloom and early post-bloom stages, reduced infection on the nuts from 48·6 to 8·4 per cent., 1 lb. in 100 gals. plus 1 qt. ortho adhesive, reducing it to 8·7 per cent. The same number of applications of Bordeaux mixture (4–2–100) plus a heavy oil emulsion (1 pint) reduced it to 7·2 per cent. Occasionally slight foliar russeting followed the use of yellow cuprous oxide, alone or in combination with ortho adhesive, but no such effect resulted when an alkyd resin spreader-sticker (emulsifier B 1956 spreader) was added at the rate of ¼ pint per 100 gals.

A dust consisting of 25 per cent. monohydrated copper sulphate, 55·75 per cent. 300-mesh hydrated lime, 10 per cent. frianite, 9 per cent. dusting sulphur, and 0·25 per cent. orvus [ibid., xxii, p. 163] flakes appeared to be more effective than a 10 per cent. yellow cuprous oxide dust. Two applications of the former in the early pre-bloom and late pre-bloom stages reduced infection on the nuts from 69·6 to 7·3 per cent., while the latter gave 22 per cent. infection; three thorough applications (including an early post-bloom spray of the yellow cuprous oxide), however, reduced infection on the nuts from 51·3 to 7·7 per cent.

In view of the present need to economize in copper, Bordeaux mixture (4–2–100)

is advised for general use. If yellow cuprous oxide is substituted it should be employed at the rate of 1 lb. per 100 gals. water, to which should be added ¼ pint emulsifier B 1956 spreader. Two spray treatments should be given, in the middle to late pre-bloom and early post-bloom stages: if only one can be made, the latter should be omitted. If dusting has to be resorted to, a monohydrated copper sulphate dust of the type mentioned above, in which talc may replace frianite, is tentatively recommended. If monohydrated copper sulphate is unavailable, a dust containing 10 per cent. yellow cuprous oxide, 67 per cent. talc or frianite, 10 per cent. diatomaceous earth, and 15 per cent. dusting sulphur may be used. Two applications should be given in the middle to late pre-bloom and early post-bloom stages. For maximum efficiency the spray equipment should operate at a pressure of 500 to 600 lb. per sq. in. A very efficient type of spray gun is the 'bloom' or 'fog-drive' gun, consisting of three or more spray nozzles mounted abreast on a crossbar fastened to an aluminium barrel with the cut-off in the basal casting. The addition of 1 oz. sugar (dissolved in water) to each 100 gals. Bordeaux mixture will preserve it for several days.

Jenkins (Anna E.). **Leaf spot on Terminalia arjuna.**—*Phytopathology*, xxxiii, 5, pp. 404–405, 1 fig., 1943.

Since 1937 *Terminalia arjuna* in the United States Plant Introduction Garden, Coconut Grove, Dade County, Florida, has been affected by a hitherto unreported disease characterized by the development on the leaf blades of circular to irregular spots, sometimes delimited by the veins, 2 to 8 mm. or upwards in diameter, wood-brown, light brownish-drab, or pale drab-grey above and mikado-brown to tawny-olive below, becoming desiccated, shrunken, and partly or entirely falling away from the rest of the leaf. Severely infected leaves which have shed much of their tissue acquire a very ragged or insect-eaten appearance. The trouble seems to be of fungal origin, the lesions bearing pycnidia of the *Phyllosticta* type and yielding on isolation a species of *Phomopsis* and *Pestalotia disseminata*.

Slagg (C. M.) & Wright (E.). **Diplodia blight in coniferous seedlings.**—*Phytopathology*, xxxiii, 5, pp. 390–393, 1943.

First-year pine (*Pinus nigra*, *P. edulis*, and *P. ponderosa*) and Douglas fir (*Pseudotsuga taxifolia*) seedlings in a Government nursery at Manhattan, Kansas, were severely blighted by *Diplodia pinea*, which was also found on the needles, needle bases, bark, and cone scales of 'die-back' branches of mature trees of *Pinus nigra*, *P. ponderosa*, *P. pungens*, *P. rigida*, and *P. sylvestris* at the State College in the same town. Uninjured seedlings of *P. nigra* were killed in 30 days by mycelial inoculations with a monospore culture of the pathogen from the same host, typical pycnidia being formed on the dead needles 15 days after infection.

Septation of the pycnospores of *D. pinea* varied widely on different hosts and on the various parts of the plants. The septate spores were darker, and wider in proportion to their length, than the non-septate, 100 of the latter averaging 35·3 by 13 μ as compared with 32·1 by 14·65 μ for the same number of the former. About 25 per cent. of all the pycnospores observed were septate, the highest number occurring on the cone scales of the twig branches, and the fewest on the long central needle.

Bingham (R. T.) & Ehrlich (J.). **A Dasyscypha following Cronartium ribicola on Pinus monticola. I. II.**—*Mycologia*, xxxv, 1, pp. 95–111; 3, pp. 294–311, 4 figs., 1943.

Amended descriptions are given of *Dasyscypha calyciformis* (on the basis of an authentic Rehm exsiccatus and four other dry specimens), and of *D. agassizii* (based on 30 specimens including a slide of the isotype). A small-spored, white-

excipled species of the same genus frequently associated with blister rust (*Cronartium ribicola*) cankers on *Pinus monticola* in the north-western United States, is stated to have often been confused in the past with the above-mentioned two species [*R.A.M.*, xxii, p. 46]. A comparative study of the three fungi showed, however, that it can be distinguished from them on the basis of the following characters. The fungus from *P. monticola* has unswollen paraphyses, round-topped ascus membranes, apothecia with relatively short stipes and narrow disks, and an abundant and conspicuous imperfect stage with subulate phialides and readily germinating conidia; *D. agassizii*, on the other hand, has swollen paraphyses, flat-topped ascus membranes, apothecia with relatively long stipes and broad discs, and an infrequent and inconspicuous imperfect stage with moniliform or slightly subulate phialides; while *D. calyciformis* has an infrequent and inconspicuous imperfect stage with conidia that germinate only with difficulty. The three species, all saprophytic or weakly parasitic, also differ in their host range and geographical distribution: the fungus on *P. monticola* seems to be restricted to this host and was found only in the north-western United States and British Columbia; *D. calyciformis* occurs mainly on *Abies*, but also on *Pinus*, *Larix*, and *Picea* in Europe; and *D. agassizii* is known, in addition to these four genera (chiefly on *Abies*), on *Tsuga* in north-eastern North America. Ascus and ascospore measurements showed that the fungus from *P. monticola* has shorter asci than *D. calyciformis*, and smaller ascospores than *D. agassizii*. It is concluded that the fungus on *P. monticola* is distinct from the other two species under consideration, but as it was not possible to compare large numbers of collections of the three fungi on various hosts, it is not proposed as a new species.

FINLAY (R. H.). **The preservation of timber, with special reference to Rhodesia.**—*Proc. Rhod. sci. Ass.*, xxxix, pp. 103–112, 1942.

The early history and modern developments of timber preservation are briefly traced and some particulars given of the application of various processes under Rhodesian conditions. Dowicide P (sodium tetrachlorophenolate and sodium 2-chloro-ortho-phenylphenolate) [*R.A.M.*, xix, p. 574] is used by the Forestry Department and at sawmills for the control of blue stain (*Ceratostomella* spp.), the Rand Mixture by the Globe and Phoenix Mine, and creosote at the Forest Reserve plant at Mtao for the treatment of *Eucalyptus* wood.

BALLMAN (D. K.) & SMITH (F. B.). **Fungicides and germicides in the pulp and paper industry.**—*Paper Ind.*, xxv, 2, pp. 143–148, 8 figs., 1943.

The immersion of pulp logs in 1 per cent. solutions of dowicide G or S has been found not only to eliminate sap stain due to *Ceratostomella pilifera*, *C. ips*, *C. pluriannulata*, *Endoconidiophora coerulescens*, *E. moniliformis*, *Graphium rigidum*, *Diplodia* sp., and *D. natalensis* [*R.A.M.*, xxi, p. 175 *et passim*], but also to decrease the loss of cellulose resulting from infection by the 'dry-rot' group of organisms, comprising *Lenzites trabea*, *L. sepiaria*, *Poria incrassata*, *Merulius* [including *M. lacrymans*], *Fomes annosus*, *F. roseus*, *Stereum sanguinolentum*, *Polystictus abietinus*, and *Trametes pini*.

The treatment of lap stock is best performed at the wet press, where a solution of dowicide F (sodium 2-, 4-, 5-, 6-tetrachlorophenate) [ibid., xx, p. 465] is sprayed on the sheet. By reason of its very low water solubility and vapour pressure, this phenol is capable of inhibiting mould growth throughout the layers of the stock. Dowicide G (sodium pentachlorophenate) [ibid., xx, pp. 465, 587] is not quite such an effective fungicide, but where freedom from residual chemical odour is a consideration it may be substituted for F at a slightly stronger concentration. The souring of pulp in the system during shut-down periods is a sequel to the

action of bacteria and moulds, which may usually be obviated by the addition of 2 lb. dowicide G per ton of pulp. This precaution is particularly necessary in the case of coloured stocks, in which changes of shade may be caused by alterations in the hydrogen-ion concentration of the system through microbiological invasion. The same preparation may also be usefully employed in the washing of felts during shut-downs at the rate of 2 to 4 lb. per 50 gals. water, the solution being thrown on at the entering side of the press in such a way that a pool of liquid forms behind the press and both felts become thoroughly saturated. By this means an increase in the life of wet felts of 10 to 15 (or up to between 40 and 60) per cent. may be effected, the corresponding extension for top or pick-up felts being from 10 to 100 per cent. Some manufacturers of heavy board from waste stock add dowicide to the system continuously at a concentration of 50 parts per million, thereby prolonging the life of the felts by 50 to 200 per cent.

Absolute commercial control of the slime-forming moulds, *Aspergillus niger*, *Penicillium puberulum*, *Chaetomium globosum*, and *Mucor racemosus* has been secured by the introduction into the system of dowicides A, B, and C (sodium ortho-phenylphenate, sodium 2-, 4-, 5-trichlorophenate, and sodium 2-chloro-ortho-phenylphenate, respectively), as well as by F and G, at concentrations of 0·02, 0·03, 0·04, and 0·2 per cent., while B was also completely mycostatic at 0·004 to 0·009 and F at the last-named strength.

The addition of dowicide G (2 per cent. by weight) to the starch adhesive used for the pasting of corrugated stock boards to the outer ply secures a mould-resistant surface, and the same product is now in commercial use for the treatment of egg case fillers and flats [ibid., xx, p. 465]. Either A or G may be applied to the inner wraps of soap, while the oil-soluble dowicide 1 (ortho-phenylphenol), dissolved in the wax used for coating the outer wraps, exerts a fungistatic and fungicidal action on mould growth below the wax film. The same preparation protects gummed tape from spoilage by moulds, while G has been shown by field tests in Louisiana and Florida to confer on insulation board and building papers immunity from termites and fungal decay, for which purpose a concentration of 0·6 to 0·75 per cent. of the dry weight of the board should be retained.

Seliskar (C. E.). **Decay in Douglas Fir cork and studies in the cultural identification of fungi causing decay in Western Hemlock and Douglas Fir.**—*For. Cl. Quart.*, xvi, 1, pp. 4–11, 1942–3. [Abs. in *Exp. Sta. Rec.*, lxxxviii, 6, pp. 780–781, 1943.]

Four fungi, viz., *Mortierella simplex*, *Dematium* sp., (?) *Chalara* sp., and an unidentified Basidiomycete, were consistently isolated from small, hollow areas scattered through Douglas fir [*Pseudotsuga taxifolia*] bark, a prolific source of high-grade cork. The decay might be mistaken for insect injury but circumstantial evidence indicates that it is due to fungus infection. Only the Basidiomycete, however, appeared to be definitely implicated. Further observations are made on the cultural identification of the wood-rotting fungi of western hemlock [*Tsuga heterophylla*] and Douglas fir, including the general plan of the studies and some of the problems to be solved.

Recognition of decay and insect damage in timbers for aircraft and other purposes.—18+iii pp., 12 figs., London, H.M. Stationery Office, 1943. 6*d*.

In this booklet, prepared by the Forest Products Research Laboratory, Princes Risborough, descriptions are given of the defects and blemishes most commonly found in the timbers generally used in aeroplane manufacture. Part I shows how 'dote' may be distinguished from other forms of discoloration, deals with defects caused by insects, and describes defects (including those produced by fungi)

characteristic of individual woods. In part II a list is given of timbers in general use, with notes on their resistance to decay and insect injury.

'Dote' is the popular name applied to the early stages of decay resulting from infection of the standing tree by heart-rotting fungi or of felled timber, either in the log or after conversion, during seasoning. In Sitka spruce (*Picea sitchensis*) and Douglas fir (*Pseudotsuga douglasii*) it is usually caused by *Trametes serialis* [*R.A.M.*, xxii, p. 187]. 'Dote' must not be confused with sap stain (blue stain) which frequently occurs together with incipient decay. Once timber has been well seasoned, further spread of sap stain is unlikely to occur, even if the timber is re-wetted.

Brown streaks due to incipient decay are sometimes confused with streaks caused by local accumulations of resin in the fibres. These resin or pitch streaks occur in softwoods, and generally extend much farther along the grain than across it, fading away gradually. They do not affect the strength of the wood.

No timber in which there is any sign of 'dote' can be accepted for air-frame construction, but if the 'dote' is only superficial, perfectly sound timber can sometimes be obtained by planing down the affected part. Similarly, if infection has entered at the end, it can be cut away. Affected timber containing a living fungus can be sterilized by exposure of 4 to 8 hours (depending on the thickness) to a temperature of 65° C. in a kiln in which a high atmospheric humidity is maintained. In general, kiln-dried timber can be considered as free from living fungal infection. There is no risk of dote spreading in a pile of seasoned timber in which the moisture content is well under 20 per cent. of its oven-dry weight.

Minor defects sometimes mistaken for 'dote' include pith flecks, scars due to bird pecks or other slight injuries to the standing tree, and the dark brown, black, or greenish streaks known as mineral streaks [cf. ibid., xxii, p. 184]. The increasing use of lamination reduces the influence of minor defects or slight traces of 'dote' upon the strength of the member as a whole, so that a more rigid standard of inspection is required when dealing with timber to be used in the solid than is necessary when it is to be laminated.

A table is given showing the general distinctions (distribution, colour, effect, and shape) between sap stain, incipient decay, and natural discoloration.

TUCKER (C. M.). **Controlling plant diseases in the home garden.**—*Circ. Mo. agric. Exp. Sta.* 238, 8 pp., 1942.

This pamphlet gives full direction for the avoidance or control of some destructive kitchen-garden plant diseases by rotation, sanitation, seed treatment, cultural practices, and the selection of resistant varieties. In connexion with the last-named factor the following points of interest may be mentioned. The Michigan and Florida Golden self-blanching varieties of celery are highly resistant to yellows while among the green sorts Paragon, Earligreen, and Sweetheart are specially recommended, but the crop is not well adapted to Missouri conditions as a whole. Resistance to pink rot [*Phoma terrestris*] and yellow dwarf is a characteristic of the Sweet Spanish onion. Some excellent maize varieties resistant to bacterial wilt [*Xanthomonas stewarti*] have been developed, including Golden Cross Bantam, Marcross, Spancross, and Whipcross.

Southern Rhodesia. Act to make better provision for the prevention of the introduction into and spread within the Colony of pests and diseases destructive to plants, and for other matters incidental thereto.—12 pp., 1942.

This Act, to be cited as the Plant Protection Act, 1942, defines the provisions laid down for the eradication and prevention of the spread of plant diseases and pests, the powers of the Governor in relation to the importation of plants into the Colony of Southern Rhodesia, the specific regulations applicable to cured tobacco, the duties of inspectors and owners of land, and other measures concerned with the

protection of plants from injurious agents [see next abstract]. The Importation o Plants Regulation Act and other laws are repealed [*R.A.M.*, xii, pp. 399, 463].

Southern Rhodesia. Government Notices 184 to 187.—7 pp., 9th April, 1943.

Under the terms of the Plant Import Regulations, 1943, made under the Plant Protection Act, 1942 [see preceding abstract], the following restrictions apply, as from 9th April, 1943, to the introduction into Southern Rhodesia of certain classes of plant material from non-scheduled States (i.e., all countries except those comprised in the Plant Interchange Schedule, namely, the Union of South Africa, Northern Rhodesia, the Belgian Congo, and Nyasaland Protectorate). The importation is prohibited of elm seeds and plants (including all species of *Ulmus*) from the continent of Europe or from any country known to harbour the disease *Ceratostomella ulmi*, and of chestnut (*Castanea*) seeds and plants from North America or any other known habitat of *Endothia parasitica*. All consignments of tea plants or seed must be accompanied by a certificate from a recognized institution in the country of origin guaranteeing the absence, within a radius of ten miles from the place of production, of blister blight (*Exobasidium vexans*). Similar guarantees are required in the case of citrus trees, budwood, and seeds in respect, *inter alia*, of freedom from canker (*Pseudomonas citri*) at a date not more than three months prior to the dispatch of the consignment, and further vouching for the non-occurrence of the disease at any time within a distance of 100 miles from the nursery or plantation of origin, except that for this purpose Portuguese East Africa [*R.A.M.*, xiii, p. 544] ranks as a member of the Plant Interchange Schedule and is therefore exempt from the provisions; of tobacco seed and unmanufactured leaf (including commercial samples) from countries in which blue mould or downy mildew (*Peronospora* spp.) [*P. tabacina*] is known to occur; of growing plants and suckers of bananas (the importation of leaves severed from the plant is categorically prohibited), the maximum number of which permitted to enter the Colony shall be twelve, each consignment to be accompanied by a guarantee of the absence of Panama disease (*Fusarium* [*oxysporum* var.] *cubense*) and leaf spot (*Cercospora*) [*musae*] from the locality of cultivation; of tomato seed from Italy, Germany, North America, or any other country known to harbour bacterial canker (*Aplanobacter* [*Corynebacterium*] *michiganense*); of maize and barley seed, consignments of which must not exceed 10 lb. in weight, and must be accompanied by a duly authenticated statement as to the freedom of the place of origin from *Sclerospora* spp. and *A.* [*Xanthomonas*] *stewarti*; and of pome fruits (including ornamentals of the genera *Cydonia*, *Malus*, and *Pyrus*) in respect of fireblight (*Bacillus amylovorus*) [*Erwinia amylovora*].

Under Government Notices 185 (dealing with nurseries) and 187, tobacco leaf curl, rosette, and 'kromnek' are declared pests and measures for their control specified.

Service and regulatory announcements. List of intercepted plant pests, 1942.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 41 pp., 1943.

Among the pathogens intercepted on plant material arriving in United States territory during the period from 1st July, 1941, to 30th June, 1942 [*R.A.M.*, xxii, p. 176] may be mentioned *Ascochyta imperfecta* on lucerne from New Zealand, *Cercospora musae* on banana from the American Virgin Islands, Cuba, Dominican Republic, Honduras, and Panama, *Chlamydomyces palmarum* on banana from Panama, *Claviceps paspali* on *Paspalum notatum* from Mexico. *P. dilatatum* from Costa Rica, and *P.* sp. from Cuba, *Cordana* [*Scolecotrichum*] *musae* on banana from Panama, *Cronartium conigenum* on *Pinus chihuahuana* from Mexico, *Diaporthe batatatis* on sweet potato from Brazil and Chile, *Helminthosporium torulosum* on plantain from Cuba, *Penicillium gladioli* on *Watsonia* sp. from South Africa, *Phoma mali* on apple from Mexico, and *Physalospora obtusa* on apple from Australia.